CERAMIC ABSTRACTS and THE BULLETIN

OF THE

AMERICAN CERAMIC SOCIETY

MAY 15, 1945

MONTHLY PUBLICATION DEVOTED TO THE ARTS AND SCIENCES RELATED TO THE SILICATE INDUSTRIES

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Publication Office: 20th & Northampton Sts., Easton, Pa.
Editorial, Executive, and Advertising Offices: 2525 N. High St., Columbus 2, Ohio.
Committee on Publications: R. L. STONE, *Chairman;* HARRY THIEMECKE, W. A. WELDON, K. C. LYON, R. C. PURDY, *ex-officio.*
Entered as second-class matter at the post office at Easton, Pa., under the act of March 3, 1879. Published monthly.
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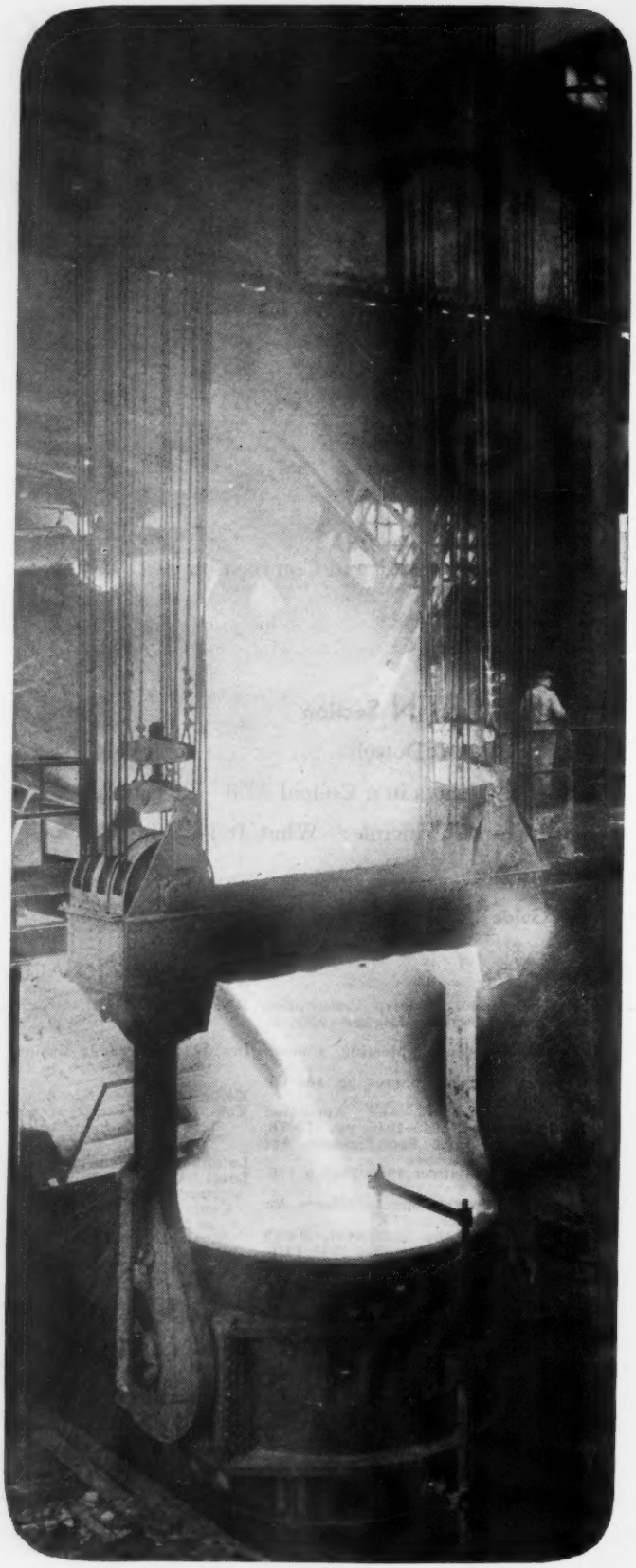

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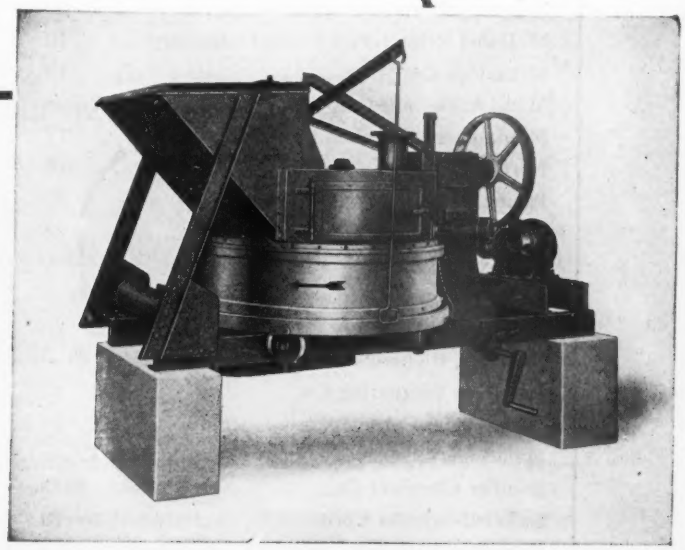

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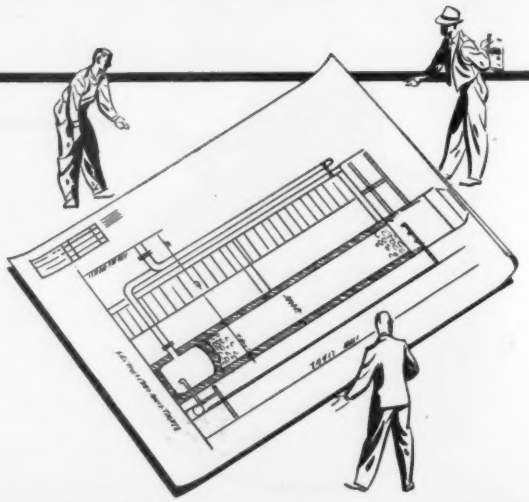

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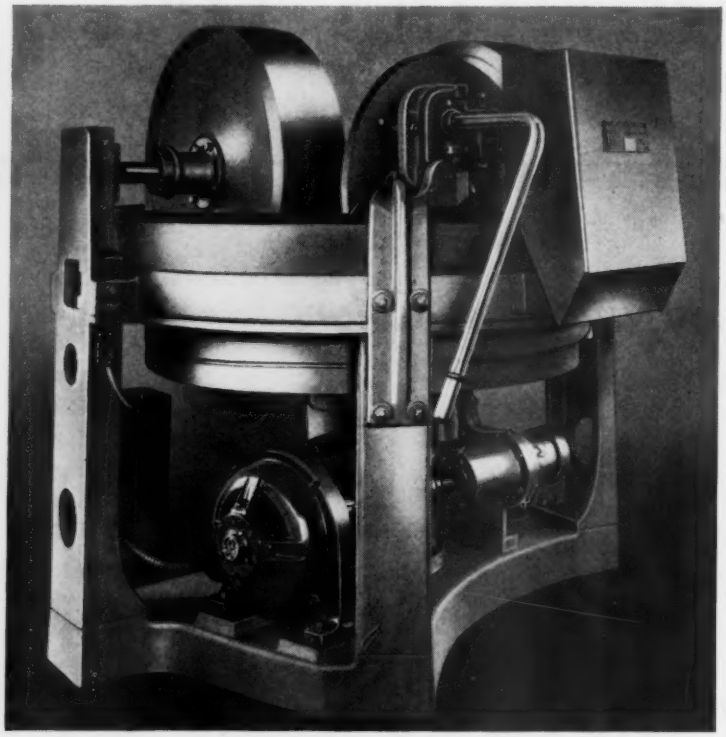

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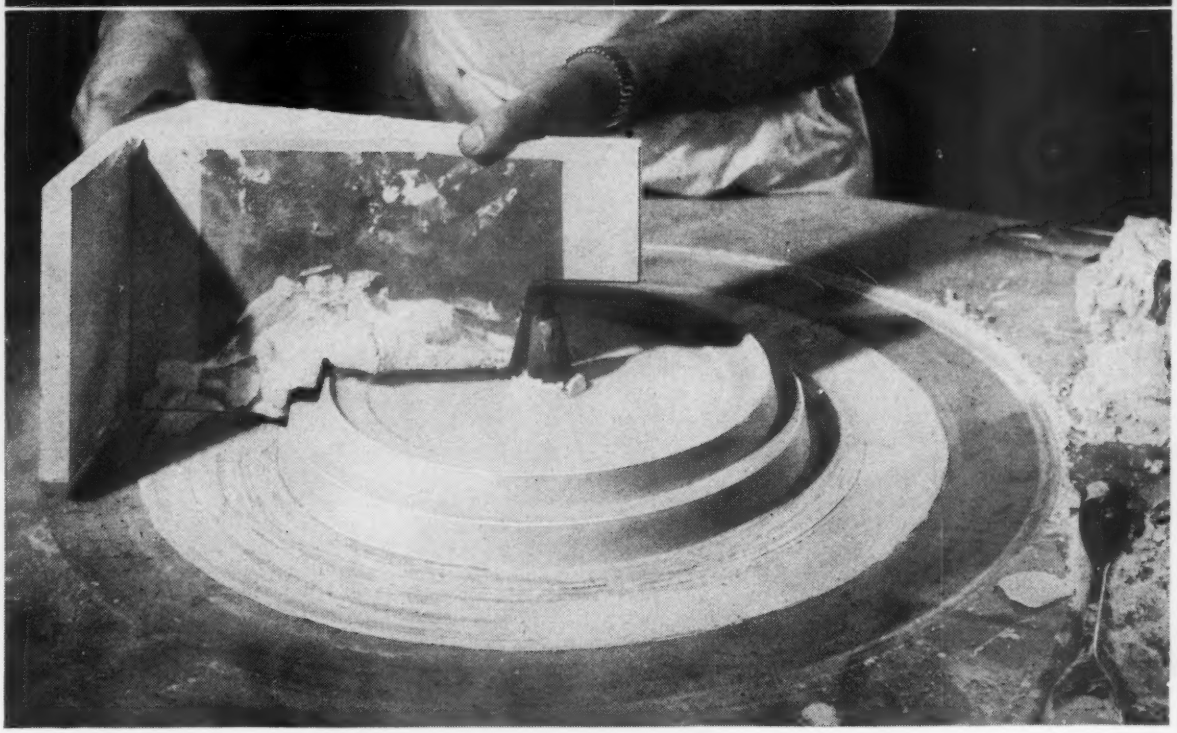

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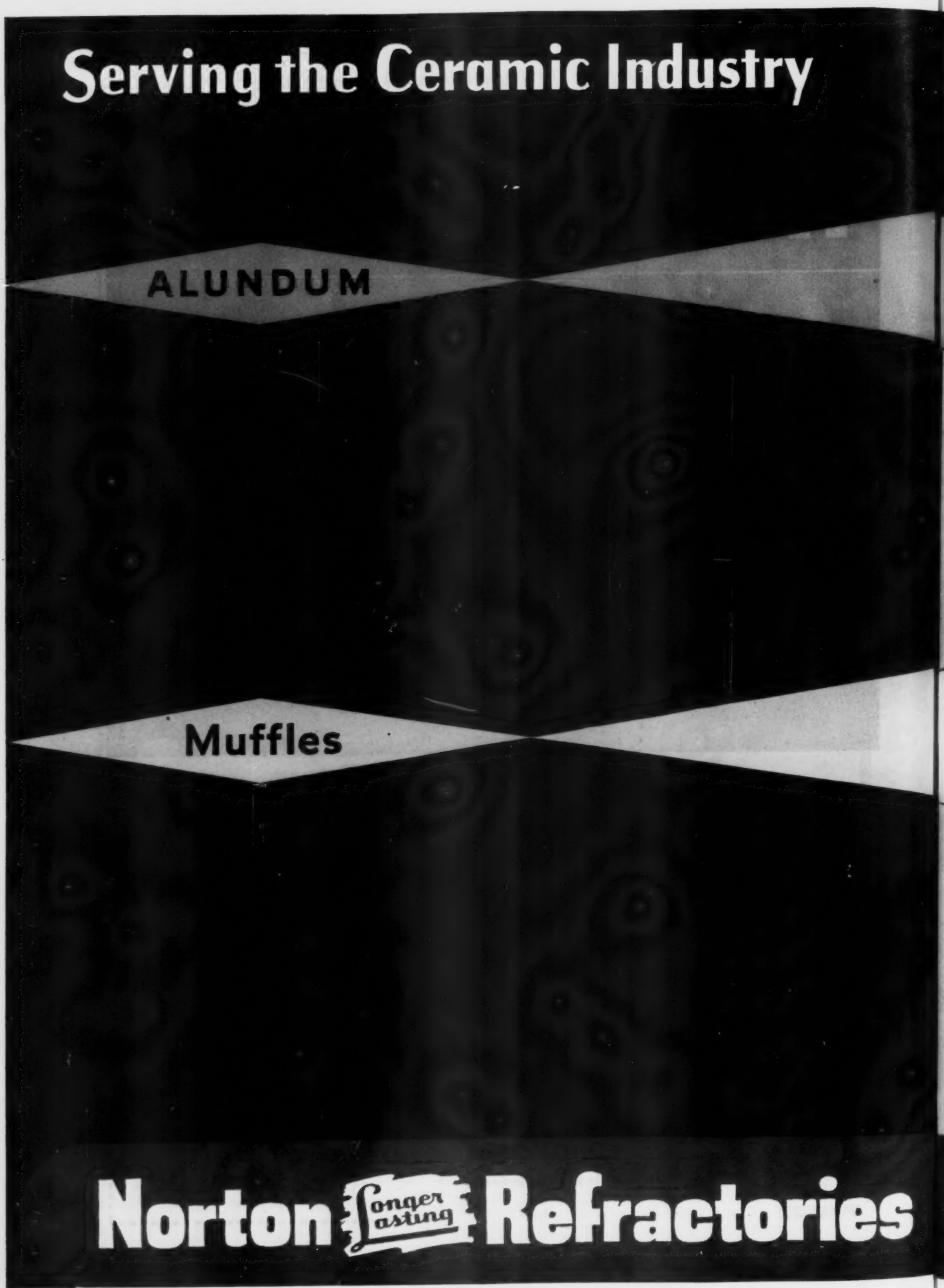

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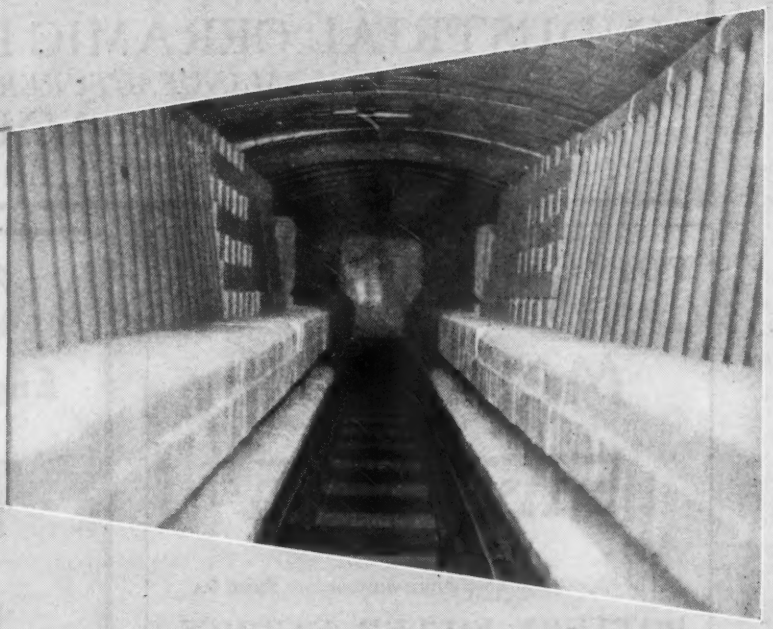

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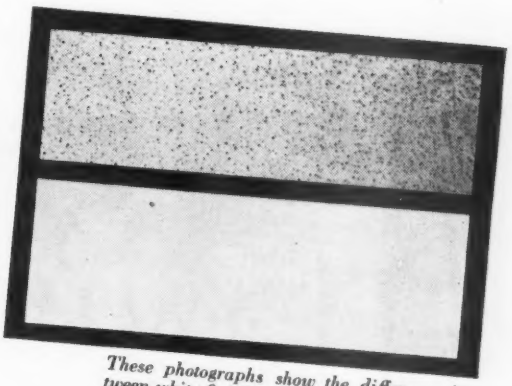
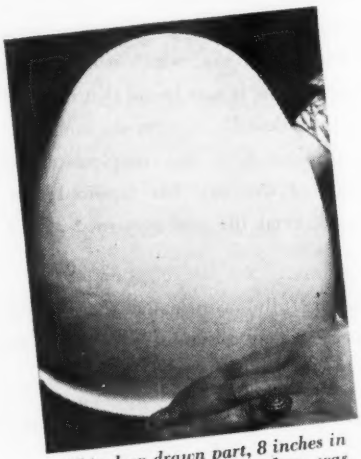


These photographs show the difference between white finish coat applied directly to the base metal and fired on ordinary enameling stock (above) and Inland Ti-Namel (below).

Hunter Nead (right) manager, and Frank Porter, ceramic engineer, both of Inland's Metallurgical and Inspection Department, check the fine quality of a single coat of enamel on a Ti-Namel panel.



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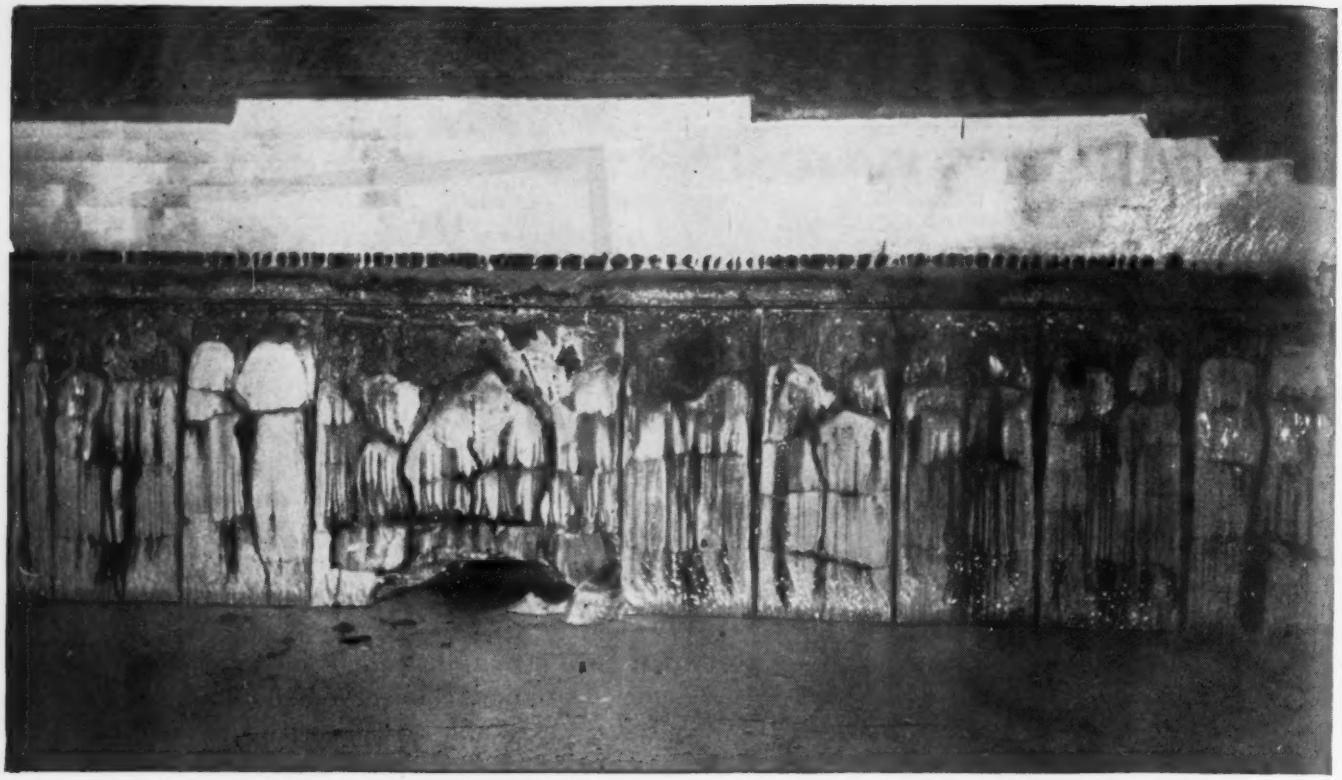

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PERIODICAL REFERENCE: The name of the periodical appears in italics, followed by the volume (bold-faced), issue number (in brackets), page numbers, and year (in parentheses).

Vol. 24 **May 15, 1945** **No. 5**

Abrasives

Corundum in the U.S.A. ANON. *Chem. Trade Jour.*, **113**, 274 (1943); abstracted in *Trans. Brit. Ceram. Soc.*, **42** [11] 112A (1943).—Corundum mining has been commenced in the U. S. for the first time since the last war. A deposit in South Carolina has been reopened; the quality of the mineral is said to approximate that of the best African grades.

Evaluation of the finish of a metal surface by a replica method. HARRY K. HERSCHMAN. *Jour. Research Nat. Bur. Standards*, **34** [1] 25–31 (1945); RP 1625. Price 10¢.—A new method for evaluating surface roughness is described, which involves the use of rapidly produced plastic replicas of variable transparency. Evaluations of surface finish made by this method on five specimens that differed significantly in degrees of finish were correlated with profile values of these surfaces determined by (1) the profilometer method and (2) the microscope on cross sections. These data show that the replica method is especially sensitive for the evaluation of surfaces having high degrees of finish. R.A.H.

Grinding faults—symptoms, causes, and correction: I and II. H. J. WILLS. *Can. Machinery*, **53** [12] 166–67, 180 (1942); **54** [1] 67–69, 106 (1943).—There are two kinds of grinding faults, (1) inaccuracies of shape or dimension and (2) surface blemishes, the latter being the most common. The principal causes may be found in the wheel, manipulations of the operator, grinding machine, coolant, or general building vibration. The grinding faults are presented for cylindrical, centerless, and internal grinding, and means of preventing them are described. M.A.S.

How to use shear type carbide cutting tools. ANON. *Can. Machinery*, **54** [8] 148, 150, 152 (1943).—This type effectively meets the problem of interrupted steel cutting. M.A.S.

Tips on increasing the life of carbide-tipped tools. J. S. GILLESPIE. *Can. Machinery*, **54** [3] 152 (1943).—Worn-out tools may be salvaged by adding overlapping tips and grinding them down to size. M.A.S.

Treatment of wet grinder coolant. GASTON E. MARBAIX, LTD. *Iron & Coal Trades Rev.*, **150** [4016] 244 (1945).—A clean coolant is essential for best results with honing and wet grinding. A motor-driven magnetic drum separator through which the coolant flows is described, whereby a considerable percentage of the metal swarf and abrasive entrained in the coolant is removed. The interception of the abrasive is further assured by an induction-magnetized apron grid surrounding the underportion of the drum, which causes the magnetized metal swarf to extend on end, thus forming a screen to strain the coolant and trap the abrasive content. M.HA.

SEPARATE PUBLICATION

Effect of Lubricating Agents in a Diamond-Drilling-Bit Coolant and Cuttings-Removal Medium. ALBERT E. LONG AND WING G. AGNEW. *U. S. Bur. Mines Rept. Investigations*, **3793**, 5 pp. (1945). Free.—Tests showed that clear water was the best bit coolant and cuttings-removal medium for diamond drilling. Bit wear was excessive when lubricating agents were used, and the most footage per bit was obtained when drilling with clear water in the normal manner. R.A.H.

PATENTS

Abrasive articles. H. C. MARTIN AND F. A. UPPER (Carborundum Co.). U. S. 2,371,700, March 20, 1945 (Oct. 12, 1943). 6 claims. (Cl. 51-298).—1. An abrasive article comprising abrasive grains and a bond therefor comprising a phenol resinoid modified by a metal selected from the group consisting of titanium, vanadium, chromium, manganese, iron, cobalt, and nickel, the metal constituent being so finely divided and incorporated into the resinoid bond as to have lost its physical identity as discrete particles to the extent that it is invisible at magnifications of 500 times.

Apparatus for grinding duplicate parts. G. S. GOULD. U. S. 2,372,824, April 3, 1945 (May 21, 1943). 4 claims. (Cl. 51-166).

Coating, particularly for manufacture of abrasives. R. P. CARLTON AND T. J. MILLER (Minnesota Mining & Mfg. Co.). U. S. 2,371,605, March 20, 1945 (June 1, 1933; March 31, 1938). 8 claims. (Cl. 117-17).

Dressing apparatus for formed grinding wheels, etc. E. W. MILLER (Fellows Gear Shaper Co.). U. S. 2,372,-

597, March 27, 1945 (Jan. 19, 1942). 16 claims. (Cl. 125-11).

Drill-grinding device. W. R. COYNE (Pillsbury Flour Mills Co.). U. S. 2,371,676, March 20, 1945 (Feb. 5, 1943). 1 claim. (Cl. 51-219).

Flexible abrasive materials. A. ABBEY (Carborundum Co.). Brit. 567,178, Feb. 14, 1945 (Dec. 18, 1492).

Grinding apparatus. R. V. HANCHETT (Hanchett Mfg. Co.). U. S. 2,371,582, March 13, 1945 (March 8, 1944). 2 claims. (Cl. 51-120).

Grinding apparatus for correcting errors in surfaces. A. O. HUGHES. Brit. 567,384, Feb. 21, 1945 (July 26, 1943).

Grinding machine. R. E. FLANDERS (Jones & Lamson Machine Co.). U. S. 2,371,685, March 20, 1945 (Aug. 17, 1940). 16 claims. (Cl. 51-95). W. A. SHANLEY. U. S. 2,372,341, March 27, 1945 (Sept. 1, 1942). 8 claims. (Cl. 51-241).

Instrument for setting position of a tool for the grinding thereof. W. J. CLEMENTS (Wetmore Reamer Co.). U. S. 2,372,552, March 27, 1945 (Dec. 5, 1942). 12 claims. (Cl. 51-220).

Machine for grinding twist drills. FRED RICKS (United Shoe Machinery Corp.). U. S. 2,372,794, April 3, 1945 (May 27, 1943; in Great Britain June 17, 1942). 11 claims. (Cl. 51-120).

Method and means for grinding chasers. J. P. GORMAN. U. S. 2,371,515, March 13, 1945 (March 13, 1943). 17 claims. (Cl. 51-218).

Saw-sharpening machine. J. T. LINDSEY. U. S. 2,371,572, March 13, 1945 (Jan. 23, 1941). 17 claims. (Cl. 76-41).

Valve grinder. W. E. WHITE. U. S. 2,371,938, March 20, 1945 (April 21, 1943). 1 claim. (Cl. 51-27).

Art and Archeology

Composition and preparation of glaze. ANON. *Ceram. Ind.*, **44** [2] 74, 76 (1945).—Formulas for cone 04 and cone 3 to 4 glazes are given, with suggestions for the development of various other glazes. The use of a triaxial diagram in such investigations is suggested to cover the field as completely and methodically as possible. H.T.

Pottery by painters. ANON. *Magazine of Art*, **38** [3] 102–103 (1945).—Three jars each by Henry Varnum Poor and Joan Miro are illustrated. Poor's vases, commissioned by Donald Desky for the lounge of Radio City Music Hall, are 14 in. high and decorated with theater and circus motifs; they were thrown and fired by the artist in his own kiln at New City, N. Y. The Miro vases, exhibited at the Pierre Matisse Gallery, New York, are high-fired ceramics, 12.5 to 14 in. high, decorated by Miro with a background of stars and planets; they were designed and fired by the Spanish ceramist, Artigas.

M.E.P.

Scholarship won. ANON. *Art News*, **44** [2] 8 (1945).—The winning of the Abraham Rosenberg Scholarship for advanced study in art by Sargent Johnson is announced by the San Francisco Art Assn. His development of ceramics as a sculptural material, with special reference to polychrome, as a direct result of his archeological research in Mexico and in this country and his desire to widen the scope of this medium, brought him this recognition.

M.E.P.

PATENTS

Ceramic glaze. A. I. SMIRNOVSKIĬ AND G. S. ETKIN. Russ. 59,371, March 31, 1941; *Chem. Abs.*, **39**, 1034 (1945).—Up to 70% of blue powder (waste product of Zn metallurgy) is added to the usual mixture of Na_2CO_3, K_2CO_3, or saltpeter and clay.

Decorating porcelain ware. B. A. KHIZH. Russ. 58,579, Dec. 31, 1940; *Chem. Abs.*, **39**, 1034 (1945).—A low-melting Cu-containing flux is applied to the goods to be decorated, and the articles are fired first in an oxidizing atmosphere at 700° to 800° and then in a reducing atmosphere.

Cements

Calcination of small limestone. ANON. *Cement Lime Manuf.*, **16**, 179 (1943).—The Power-Gas Corp., Ltd., of Stockton-on-Tees is reported to have acquired rights from the Ellerman Co. of Utah for the manufacture of its patented vertical limekiln. This type of kiln is suitable for the calcination of $^1/_4$- to $^5/_8$-in. limestone and is built in units having an output of lime of 5 tons per day. See "Vertical. . .," *Ceram. Abs.*, **23** [1] 6 (1944).

R.W.McA.

Heat economizer for wet and dry process [kilns]. HENRY POOLEY. *Cement Lime Manuf.*, **17**, 99 (1944).—With the Miag calcinator, using standard coal and 40% moisture in the slurry, coal consumption of about 23% is possible, but it is attended by high (as much as 25% of raw material) dust losses. In the case of the Polysius slurry drier, the fuel consumption is about 24%, but the dust generation is usually less. In dry-process operation, coal consumption as low as 13% is possible with the Polysius Lepol kiln, but the apparatus is expensive and a great deal of dust is generated. Miag calcinators are used in dry-process operation with 15 to 16% fuel consumption but are also extremely dusty. Vickers-Armstrong, Ltd., has a desiccator built as an extension of the kiln but integral with it, which operates exceptionally well in wet-process operation. Exhaust gas temperatures are reduced from 400° to 180°C. by its use. Fuel consumption is 23.5 to 26%. The unit installed at the Chinnor works in Oxfordshire is on the feed end of a 203- x 9-ft. kiln and is 12.5 ft. in diameter and about 30 ft. long. One recently installed at Aberthaw and Bristol Channel Portland Cement Co. is 31.5 ft. long and 13 ft. in internal diameter attached to a 200- x 9-ft. kiln. Chains are installed in the enlarged desiccator zone. Clinker rings do not develop with this equipment. Vickers-Armstrong, Ltd., has also devised an integral preheater for dry-process kilns which should give a fuel consumption of 15% with a minimum of dust generation. The unit consists of an enlarged feed-end section filled with longitudinal tubes through which the feed passes after passing from the center area through radial chutes. The hot gases pass through and around the tubes. Spiral lifters draw the material into the kiln proper from the discharge chutes. Mild steel plates are used in the construction.

R.W.McA.

Heat efficiency of a cement kiln and waste-heat boiler. H. H. WRIGHT. *Commonwealth Engr.*; abstracted in *Cement Lime Manuf.*, **18**, 14 (1945).—W. reports the operation of a South Australian Portland Cement Co. kiln with attached waste-heat boiler. The kiln is 157 x 8.5 ft. with a 7-in. brick lining. The waste-heat boiler has horizontal tubes and 6843 sq. ft. of heating surface. The daily kiln feed rate is 205 tons of raw feed to produce 133 tons of clinker; kiln speed is 67 sec. per revolution; raw-meal composition is 76.4 $CaCO_3$, 3.8 $MgCO_3$, and 8.7% $Al_2Si_2O_7$; hourly coal-feed rate is 1.91 tons (12,500 B.t.u.); kiln discharge gas temperature is 1500°F.; waste heat boiler gas discharge temperature is 350°F.; electrical power generation is 620 kw. or 830 h.p.; kiln dust per day is 16.5 tons; and CO_2 by Orsat analysis is 15.6% (O_2 = 8.9%). Of the 55.5 million B.t.u. heat input, heat outgo is estimated as follows:

	(B.t.u.)
Heat in exit flue gas	22.8 million
Heat to decompose $CaCO_3$	11.5 "
Heat in discharged clinker	3.8 "
Heat lost by production of CO	2.5 "
Shell radiation loss	4.5 "
Shell conduction loss	6.0 "
Latent heat of steam from H_2 combustion	1.8 "

R.W.McA.

Mills for clinker grinding. ANON. *Cement Lime Manuf.*, **18**, 1 (1945).—Various types of cement grinding mills, such as millstone units, separators, and classifiers and tube, side-roll, rod, and Hardinge mills, are described and discussed. The 1500-h.p. multichamber will produce 25 and 40 tons per hr. of superfine and ordinary cement, respectively. R.W.McA.

New method of kiln erection. ANON. *Cement Lime Manuf.*, **17**, 20 (1944).—The method used by the Aluminum Co. of America in erecting 250-ft. x 12-ft. 6-in. rotary kilns is described; 98-ft. sections weighing 100 tons are mounted on "scissor-leg" supports and brought into proper position for welding on such supports. R.W.McA.

Notes on cement-aggregate reactions in concrete. DUNCAN MCCONNELL AND WILLIAM H. IRWIN. *Amer. Mineralogist*, **30**, 78–80 (1945).—Cements with over 0.6% alkalis have been found to react with some types of aggregates. Test bars using these aggregates were made up, and the expansion was measured. The aggregates, listed in order of decreasing activity, are opal, opaline shale, alunite, rhyolite, Pyrex-brand glass, pitchstone, phyllite, chert, novaculite, acid volcanics, andesites, and obsidian. W.D.F.

Possibilities of manufacturing crack-free concrete with particular consideration of the technical principles of cement. G. MUSSGNUG. *Zement*, **32**, 61–68, 89–93 (1943); abstracted in *Chem. Zentr.*, **1943, I** [26] 2716–17.—The characteristic properties of cement can be improved with certainty by an increase in calcium silicates and a reduction of calcium aluminates. For the same degree of lime saturation, the clinker rich in silicates is generally superior to the clinker poorer in silicates with regard to mechanical strength and shrinkage; this should contribute to a reduction in cracking. The tricalcium silicate content plays a very important part; an increase in tricalcium silicate practically means an increase in the degree of lime saturation. The firing process is not only a chemical process (reactions) but also a question of technical importance (temperature, method). In obtaining the best properties in cements, the ratio $SiO_2:Al_2O_3$ is of importance. The cooling of the clinker has practically no influence on the properties of the cement. M.HA.

Protection of cement mortars from gypsum-containing waters. KURT CHARISIUS. *Giorn. Chimici*, **35**, 89–90 (1941); abstracted in *Chem. Zentr.*, **1943, II** [14] 1303.—As the presence of gypsum in cement mortars leads, after some time, to swelling with subsequent destruction, C. recommends counteracting this effect by the addition of precipitated $BaCO_3$. M.HA.

Spectrographic determination of sodium, potassium, and lithium in Portland cement with the direct-current arc. ARMIN W. HELZ. *Jour. Research Nat. Bur. Standards*, **34** [2] 129–42 (1945); RP 1633. Price 10¢ from Supt. of Documents, Washington, D. C.—Spectrographic methods, which are much less time-consuming than the usual chemical methods, are described. For the determination of sodium and potassium, the sample is mixed with a mineral base containing silver for the internal standard. For lithium, a standard mixture of graphite and strontium carbonate is added to the cement sample. In either case a fixed amount of the resultant mixture is placed in the crater of a d.-c. arc. A discussion of the development of the method is given, followed by details of the adopted analytical procedure. The spectrographic analyses of 41 cements for sodium and potassium are given for comparison with the chemical values. R.A.H.

Wet or dry process of Portland cement manufacture. H. ANDREWS. *Cement Lime Manuf.*, **17**, 77 (1944).—The wet process of cement manufacture has been universally adopted in Great Britain, although fuel consumption is higher than with dry-process kilns. A fuel-saving machine recently developed consists of an inclined grate down which the cement raw material passes countercurrent to the hot kiln gases. The kiln gas temperature is reduced from 1400° to 450°F. R.W.McA.

PATENTS

Hydraulic cement of high density. N. A. TOROPOV AND P. F. KONOVALOV. Russ. 58,566, Dec. 31, 1940; *Chem. Abs.*, **39**, 1033 (1945).—To the usual cement ingredients are added Ba compounds, e.g., BaO.

Enamel

Color in postwar enamels. E. WINTER. *Ceram. Ind.*, **44** [2] 58–60 (1945).—New colors in enamel will be essential for postwar enamel business because of the plastics competition. It has been proved that design possibilities for enamel are limitless. A constructive research program to develop new and better colors will be a long step toward the wider use of enamels. H.T.

Enamelers publicize million-dollar campaign at housewares show. ANON. *Ceram. Ind.*, **44** [2] 50, 52 (1945).—A report of the 1945 Housewares Exhibit, Chicago. New products were few, but the enameled utensil campaign was noteworthy. Planned to continue for three years, this campaign is sponsored by 13 enamelware manufacturers. 6 photos. H.T.

Ing-Rich contributes to war effort; plans future production. ANON. *Ceram. Ind.*, **43** [6] 54–57 (1944).—The war production and postwar plans of the Ingram-Richardson Mfg. Co., Frankfort, Ind., and Beaver Falls, Pa., are described. The company produces enameled parts in peacetime and shifted over to the production of armor plate, boiler parts, and parts for LST's during the war. 18 photos. See "How...," *Ceram. Abs.*, **24** [3] 51 (1945). H.T.

One-coat white enamels subject of stove meeting. ANON. *Ceram. Ind.*, **44** [1] 63–65 (1945).—A report of the meeting of the Institute of Cooking and Heating Appliance Manufacturers, Dec., 1944, Cincinnati, Ohio. See "Progress...," *Ceram. Abs.*, **24** [3] 52 (1945). H.T.

Relation of metal thickness, enamel thickness, and bottom radius to impact resistance of porcelain enameled utensils. F. A. PETERSEN AND A. I. ANDREWS. *Jour. Amer. Ceram. Soc.*, **28** [4] 102–109 (1945).—34 references, 8 figures.

Valuable informers in glass tank furnace operation. CLARE CHAFFEE. *Ceram. Ind.*, **43** [6] 61 (1944).—C. discusses the advantages of temperature, fuel-flow, and furnace-pressure instruments. 2 photos. H.T.

PATENTS

Butt-welded joint between lined parts. W. E. CRAWFORD (A. O. Smith Corp.). U. S. 2,372,712, April 3, 1945 (Dec. 1, 1941). 6 claims. (Cl. 285-111).

Multicolored enamels and glazes. DEUTSCHE GOLD- UND SILBER-SCHEIDEANSTALT VORM. ROESSLER. Belg. 447,374, Oct. 31, 1942; *Chem. Abs.*, **39**, 1034 (1945).—Complex polysulfides (1 to 5%) of the type of ultramarine are added to the enamel to be colored.

Glass

Analysis of glass fractures. CHARLES D. OUGHTON. *Glass Ind.*, **26** [2] 72–74, 90 (1945).—When glass fractures, characteristic patterns form on the new surface which are indicative of stress conditions at the instant of fracture. Fractures prepared under controlled conditions permit the analysis of unknown glass fractures for their origin, cause, and direction. Photographic reproductions made with light reflected from the surfaces fail to show much of the detail. A shadow photography technique uses a specimen which has been polished on the surface opposite the fracture pattern. The polished surface is placed directly upon photographic film, and light from a point source is passed through the glass onto the film. Illustrations depict samples fractured under known conditions of tension and compression. 2 references, 8 illustrations. A.P.

Basic glass fibers. ANON. *Chem. & Met. Eng.*, **50** [10] 160 (1943); see "Glass fiber. . . ," *Ceram. Abs.*, **24** [3] 53 (1945). B.C.R.

Batch mixing and feeding. W. R. LESTER. *Glass Ind.*, **25** [12] 545–47, 566 (1944).—Modern storage, mixing, conveying, and feeding of raw materials and batch have developed to meet the quantity and quality demands of mass-production methods. Raw material storage units are designed to take care of angle of repose, baffling, and prevention of moisture and sweating. For some materials the problem of contamination during storage has been solved by the development of special products, such as dehydrated borax and nonlumping salt cake. Manual, semiautomatic, and fully automatic weighing, collecting, and mixing operations depend upon the proper use of the scale and mixer. Segregation during conveying is minimized by matching grain sizes, elimination of unnecessary motions and movements, and proper design of storage silo or bin. The unit system keeps the batch quiescent. Intelligent hand feeding is still one of the most effective methods of distributing the batch across the melting chamber, but many mechanical devices are in use which maintain a constant rate of feed. Two new methods deliver the batch (1) through a triangular doghouse in predetermined islands and (2) along the entire back wall as a shallow blanket. In both cases the batch is presintered, which lessens dusting and segregation inside the furnace. The batches are generally compromises in composition and chemical accelerators for best melting. Studies on the effects of particle size on the rate of melting may favor finer materials and briquetted or dry-pressed batch. 7 photos. A.P.

Borsil 7-93 glass. O. K. BOTVINKIN. *Legkaya Prom.*, **1** [3] 20–22 (1941); abstracted in *Chem. Zentr.*, **1943, I** [21] 2229.—B. reports on experiments made to produce heat-resistant types of glass as a substitute for quartz glass, which is sometimes unsuitable for certain purposes as it is difficult to work. A glass melted from 75 SiO_2, 20 B_2O_3, and 5% Na_2O at 1470° to 1480° had properties fairly similar to those of quartz glass and could be worked at about 1300°C. It was elastic enough for the production of glass fibers and had a very high electric puncture voltage. It can also be used for the manufacture of microporous glass filters. M.HA.

Chemical deposition of copper mirrors on glass. EVELYN C. MARBOE AND W. A. WEYL. *Glass Ind.*, **26** [3] 119–20, 136–38, 142, 149 (1945).—Deposition of metallic copper on glass surfaces by chemical reactions is useful for detecting invisible films of noble metal, for mirror formation, and for metal-to-glass seals. Conditions affecting the formation of metal mirrors on glass include the type of chemical reaction, the participation of the glass surface, and the prohibition of recrystallization. Copper can be deposited from the vapor phase by (1) reaction of cupric chloride with hydrogen, (2) pyrolysis of metallo-organic compounds, or (3) base exchange with subsequent reduction. A new technique has been developed for improving the adherence of metals deposited by the thermal decomposition of metallo-organic compounds, involving volatilization of the compound in a vacuum and its decomposition on the glass which has been heated uniformly to a higher temperature. The preparation of some of the useful metallo-organic compounds, copper formate and acetylacetonates of copper, nickel, and platinum, is described. Most important for depositing metallic copper from solutions are the phenylhydrazine and tartrate-formaldehyde methods. From the solid phase, copper can be deposited by heating glass in contact with copper hydride. Either alone or after pretreatment of the glass with a noble metal, the hydride readily forms a thicker layer of copper which can be polished. 21 references. A.P.

Colloidal graphite and its uses in the glass industry. RAYMOND SZYMANOWITZ. *Glass Ind.*, **26** [3] 125–27, 151 (1945).—Synthetic graphite is chemically and crystallographically identical with the natural mineral but is purer, less cohesive, and more resistant to oxidation. By colloidizing, the graphite acquires the ability to remain in suspension in liquids, to pass through small interstices, and to adhere to surfaces. The mineral oil and water suspensions are of greatest interest to the glass industry. Films of graphite formed by evaporation of the water carrier are used on turn pins, pincers, cones, and similar shaping tools; on molds such as for miniature lamp bulbs; as a coating for paste molds; and for repairing scratches in cast-iron molds. Colloidal-graphited oil forms a "graphoid surface" on friction parts which retains oil, discourages rupture of the oil film, and functions as a dry lubricant for short periods in the absence of oil. In the lubrication of devices subjected to high temperatures, it is customary to use a suspension in water-white kerosene or straw paraffin oil. The carrier is important in mold work, because its rate of volatilization controls the effectiveness of the film. Colloidal-graphited oils are used on O'Neill machine molds for polish and economy, on parison molds to aid flow and prevent dragging, on fancy containers to correct adherence to indentations, on pressed ware for removing screw pegs from semiplastic glass, for protecting molds in storage from corrosion, and for breaking in new molds without excessive lubrication. 10 references, 3 illustrations. A.P.

Combination of plastics and glass. ANON. *Machinery* [N. Y.], **50** [11] 210 (1944).—The Owens-Corning Fiberglas Corp. manufactures sheets of plastic reinforced with fibrous glass cloth. Tensile strengths of up to 55,000 lb. per sq. in. are obtained. E.W.R.

Constitution of glass: VI. BRUNO SCHWEIG. *Glass*, **20** [12] 313–14, 318 (1943); see "Glassforming. . .," this issue, p. 100. **VII.** *Ibid.*, **21** [1] 7–11 (1944); for Parts **IV** and **V** see *Ceram. Abs.*, **23** [2] 37 (1944). B.C.R.

Decolorizing tank glass. A. C. OTTOSON. *Ceram. Ind.*, **44** [2] 63–65; [3] 66–68 (1945).—O. discusses the various factors in the production of crystal clear glass in continuous tanks: mechanical, chemical, and physical decolorization and the control of combustion atmosphere. H.T.

Efficient technique of making glass gauges. ANON. *Tool & Die Jour.*, June, 1943; abstracted in *Ceram. Ind.*, **42** [3] 52 (1944).—Glass replaces critical steel as a material for precision gauges. The manufacture of glass gauges is described. See "Grinding. . .," *Ceram. Abs.*, **23** [3] 52 (1944). H.T.

Eighth Urbana glass conference. ANON. *Glass Ind.*, **25** [12] 543–44 (1944); *Ceram. Ind.*, **43** [6] 58–60 (1944).—After a lapse of two years, the annual conference on glass problems sponsored by the Chicago Section of the American Ceramic Society and the Department of Ceramic Engineering of the University of Illinois was resumed Nov. 16–17, 1944, featuring a symposium on glassmelting in tank furnaces. Summaries of the papers and high lights of the discussion are given. A.P. & H.T.

Elementary principles of controlling quality of product during manufacturing. JOSEPH MANUELE. *Glass Ind.*, **25** [10] 450–54, 466, 468 (1944); *Ceram. Ind.*, **43** [5] 47–49 (1944).—Control of quality reduces rejects, secures maximum production from equipment, and assures the lowest unit cost. Statistical control charts permit the adjusting of processes so that no rejections are necessary.

Rejections for dimensions may be caused by the average being displaced with reference to the nominal dimension, by inconsistency in the process, or by both. When assisting in setting up for production, the inspector can guide the machine setter by fitting the data to the normal distribution curve centered about the tolerance limits. If the standard deviation is too large, the base of the curve is too wide and some pieces will still be rejected. The machine must be tuned up, or cull inspection will be necessary to remove defective parts. On automatic machines, control charts can be used to show the most economical initial setting in anticipation of tool wear and when to stop the machine for adjustment. Statistics are not essential for quality control. Another method is "first piece and patrol inspection." After the operator has his machine operating stably, the inspector makes a complete and thorough inspection of the part or assembly for all pertinent features of quality. If satisfied, he makes out an Operation Inspection tag which authorizes the operator to proceed. At the discretion of the inspector, the work area is revisited to check on manufacturing conditions, operator morale, and parts being produced. On the tag he notes the time of inspection and the number of pieces produced. When the run is completed, need for redressing the tool is noted. If defective parts are being produced the tag is lifted, and operator and foreman must make adjustments. This type of inspection controls quality of parts so effectively that they can be put directly into assembly lines. "Patrolling the line" inspectors control quality by observing the operators. Provision must also be made for "inspecting the inspector's work." 16 illustrations. A.P.

GCA research and service at the Preston Laboratories. L. G. GHERING. *Glass Ind.*, **25** [10] 455–56, 470 (1944).—Glass Container Assn. research projects at Butler include standard testing procedure, cord, and impact projects. The work is directed by a five-man committee from the industry and is reported through technical bulletins. The most important discovery in the research on testing and mechanical strength is the dominating role of the condition of the glass surface. Cord research has developed the centrifuge technique for measuring density differences of the glass within a particular bottle. It is being used as a trouble-shooting tool. Plots of day-to-day differences in the density of glass from tanks show that cord usually accompanies sharp fluctuations in density. A predominant cause of density variations is scale errors in the batch house, and statistical controls based on a control-chart method are being applied to eliminate the variation. Good, fast, precise methods of measuring density are needed, and a sink-float method for plants is being worked out. In the beginning the project work was defensive, but it must now become aggressive. Quality and service are going to be important in meeting competition from other materials. A.P.

Glass—a summary of its development as an art and as a science. FRANCIS C. FLINT. *Glass Ind.*, **26** [3] 122–24, 140, 144, 150 (1945).—Glass manufacture developed first as an art, and the emphasis continued to be on craftsmanship and art until after the Civil War. The invention of the blowpipe technique is still the most important factor in glassmaking. Modern machine development started about 1825 with the side-lever press and has been made possible by mechanically inventive blowers aided by operator-owners with vision. Machines called for greater control, and science was applied to glassmaking, first to study the raw materials, then to control methods, and gradually to more fundamental work. Because this country had no central guiding organization, it developed a diversified line of thought and approach which, combined with the unique engineering attitude in America, has brought glass as a business and as a science to the fore. Both bulk glass and specialty glasses have improved parallel to the advances in fundamental scientific knowledge. Phase-rule studies of the silicates, accurate measurement of viscosities, and X-ray analyses of atomic arrangements have contributed to a good portion of the recent ideas. Physical properties have become more accurately known, and the effects of thermal history have been discovered. Applied physics and chemistry have shown how to strengthen glass, leading to new commercial products in engineering, physical, and chemical categories. The advances are only preliminary to much greater developments in the future. 20 illustrations. A.P.

Glass cloth plus resin for plane building. ANON. *Mfrs. Record*, **113** [1] 44–45 (1944).—Available glass fibers have a tensile strength of 250,000 lb. per sq. in., but it is hoped that finer fibers with higher strength will be forthcoming after the war. 4 photographs. See "Glass-plastic. . . ," this issue; "Training. . . ," *Ceram. Abs.*, **23** [7] 123 (1944). M.R.

Glass factory of 194x. ANON. *Glass Ind.*, **26** [1] 29 (1945).—The subject of the 1944 prize-winning thesis at the University of Manitoba School of Architecture was the complete design of the ideal glass factory of 194x. John C. Parkin based his design on a study of Glass Containers, Ltd., in Winnipeg and five modern American plants. A photograph of a large colored model illustrates the functional features. A.P.

Glass fibers very strong in proportion to weight. ANON. *Science News Letter*, **45** [11] 163 (1944). G.A.K.

Glasshouse friggers: Bugles and bells. T. TAYLOR SEAGO. Reprinted in *Glass Ind.*, **25** [3] 113 (1944); see *Ceram. Abs.*, **23** [2] 34 (1944). **Glass dumps.** *Pottery Gaz.;* reprinted in *Glass Ind.*, **25** [4] 167, 189 (1944). A.P.

Glass-plastic material. GAMES SLAYTER. Read before the Industrial Minerals Division, American Institute of Mining and Metallurgical Engineers; abstracted in *Chem. Industries*, **53** [5] 714 (1943).—A plastic reinforced with glass fibers is now being employed for aircraft construction; it possesses hitherto unattainable strength in proportion to weight. Experimental samples have tensile strengths over 80,000 lb. per sq. in. It has an impact resistance of over 20 ft.-lb. compared with 2 ft.-lb. for plastics. It can be molded at low pressures in inexpensive molds. A short description is given of the principle involved in the manufacture of glass and plastic combinations. See "Increasing. . . ," *Ceram. Abs.*, **24** [1] 8 (1945). E.D.M.

Glass-processing machines for lamp and valve manufacture. ANON. *Engineering*, **158** [4099] 85–87 (1944).—A description of several types of glassworking machines is prefaced by an outline of some of the physical properties of glass. The high temperatures involved in the mechanical handling of glass and the wide difference between the lowest point of the annealing range and the highest point of the working range necessitate flexibility in heat control, while the difference in the expansion coefficients and the avoidance of steep temperature gradients within the parts are of much greater importance than with other materials. The machines described are mostly of the lathe type, heating being effected by a gas flame. The universal lathe is used in such work as the sealing together of two glass components or the sealing of glass to metal. The lathe is 8 ft. long and will accommodate work up to 10 in. in diameter. Several types of chucks especially designed to handle glass are described. For butt-joining glass to metal, a copper sleeve bell-mouthed at both ends is located on a mandrel at a point in line with the burners. The glass tubes to be attached to the copper sleeve are held in two collet-type chucks. For the annealing of two glass tubes to a disk, a vertical double-headed machine is used. For a side-stemming operation, the machine is rotary only to the extent that the headstock chuck can be turned by hand, power rotation being unnecessary. In the preparation of a glass button on a metallic conductor, a thick cylinder of glass is slipped over the rod and fused into position at slow speed. When molten, the bulk of the glass is scraped toward the center from both ends of the mass. The final result is a flat circular button set in the middle of a length of thin glass sheathing. 7 illustrations. See "Processing. . .," *Ceram. Abs.*, **23** [11] 188 (1944). G.A.K.

Glass research turns to crystal chemistry. N. J. KREIDL. Read before the Ann Arbor Section of the American Chemi-

cal Society; abstracted in *Glass Ind.*, **25** [9] 409, 425 (1944). A.P.

Ice flower glass. ANON. *Diamant*, **65**, 25–28 (1943); abstracted in *Chem. Zentr.*, **1943, II** [3] 262.—The manufacture of ice flower glass consists of the accumulation and proper direction of special fracture processes in the glass by means of animal glue. The glass surface is roughened with a sandblast to make the glue adhere better. This produces irregular cracks which go into the glass. To produce ice flowers, the glue must dry to complete brittleness. The practical methods are described in detail. M.Ha.

Improvements in tank-furnace design. F. G. SCHWALBE. *Glass Ind.*, **25** [12] 550–53, 562 (1944).—The value of a glassmelting-furnace improvement depends upon the manner in which the furnace is operated. The batch should be properly mixed and proportioned. Combustion should be controlled by correcting the air input for seasonal and hourly temperature, relative humidity, and barometric pressure changes. For proper air distribution, reversing valves should not leak, and frictional resistance should be the same on both reversals. Full opening slide damper type valves are recommended. Individual regenerators for each port with automatically controlled mechanical draft stacks are in use. Port areas should be proportioned to the required heat input. The trend has been to standard shapes of refractories installed with the help of portable grinding disks and cutting saws. A recording instrument that measures the intensity of radiation has shown interesting facts about distribution within a furnace and should be valuable for research and control on flame characteristics and heat distribution. For greater tonnage outputs it is desirable to increase furnace widths and combustion-chamber volume. Waste-gas velocity in the checker chambers is being decreased to 4 ft. per sec., and passages are being made larger. Patented checker settings are finding uses in special applications. Special refractories in port uptakes, regenerator crowns, and top courses of checkers are reducing slagging. Higher checker chambers are bringing heat economies. Thicker silica crowns and crown insulation are also increasing economy. Deeper furnaces protect bottoms and decrease sensitivity to temperature changes. Water coolers on the throat cover and facing blocks are being universally used. Wide throats are not conducive to best operation. Conversion from natural gas to fuel oil required changes in furnace design. Burners were installed in the back wall except on large, high-tonnage furnaces. The oil burners fire through conventional gas burner blocks, using steam for atomization. The steam retards the rate of combustion and causes minimum damage to port bottoms and jambs. Operating economies have been on a par with gas furnaces. High pressure air atomization oil burners are the preferred type and are being used with combined over and under port firing. Limiting burner capacities to 50 gal. of oil per hour provides better flame control and coverage and prolongs the life of the burner and port structure. Electric melting and unorthodox designs for special applications have been under wartime development, and the postwar period should see innovations in furnace designs that will improve their operation and output and the quality of the product. 8 illustrations. A.P.

Mechanical properties of solids. E. N. DA C. ANDRADE. James Forrest Lecture to the Institution of Civil Engineers; condensed in *Nature*, **148** [3757] 520–25 (1941); *Engineer*, **171** [4457] 380–83; [4458] 394–95 (1941); *Chem. Age* [London], **44** [1144] 301 (1941); abstracted in *Met. Abs.* (Inst. Metals), **9** [1] 4 (1942).—A. confirms a hypothesis by A. A. Griffiths that the low actual strength of glass compared with its theoretical strength is due to the appearance of very small surface cracks. He has shown that these cracks can be made evident by the attack of sodium vapor and that the surface cracks on annealed surfaces always meet at right angles to each other, thus showing that they are due to the release of strain. An experiment by Orowan, which supports the crack theory, indicates that the normal strength of mica is 3 bars, but when the stress is applied in the center of the mica so that the edges are not under strain, the strength increases to 32 bars (1 bar = 10^6 dynes/cm.^{2}). A.B.S.

Pittsburgh Plate perfects camera glass. ANON. *Glass Ind.*, **25** [12] 566 (1944).—Dale W. Rinehart of the Research Division of the Pittsburgh Plate Glass Co. determined how to control plate glass to the tolerances necessary to make feasible its use as a camera sighting window in planes more than six miles high. Meticulous inspection of each window is done with a unit simulating that used in actual aerial work. A.P.

Relaxation of stresses in annealing glass. ARTHUR Q. TOOL. *Jour. Research Nat. Bur. Standards*, **34** [2] 199–211 (1945); RP 1637. Price 5¢ from Supt. of Documents, Washington, D. C.—An empirical equation representing relaxation of stresses in annealing glass is derived. Although the derivation is based on Maxwell's equation for viscous flow, consideration is also given to the changing viscosity as a glass anneals at a constant temperature. This new equation has been applied to data that were obtained by Adams and Williamson on the relaxation of stresses in annealing glass at various temperatures. It is shown that this equation applies very satisfactorily to their data. It also appears to be much more suitable than the reciprocal relation proposed by these authors as a substitute for the wholly unsatisfactory exponential relation that is derived directly from Maxwell's equation. This exponential relation is unsatisfactory simply because it does not take into account the changing viscosity of annealing glass. The new equation leads to a clearer understanding of the nature and behavior of glass because it does not neglect the change in viscosity. R.A.H.

Secondary glass constituents: I, Boric oxide. BRUNO SCHWEIG. *Glass*, **22** [1] 9–10, 14 (1945).—Ancient and modern glasses are compared. The effect of boric oxide on the behavior of the molten glass and on the physical properties of the finished glass is discussed briefly. B.C.R.

Shape of refractory corrosion produced by molten glass. G. H. JOHNSON AND A. E. BADGER. *Glass Ind.*, **25** [9] 404, 426 (1944).—The phenomenon known as "shelving" of tank blocks has been attributed to glass of higher density resulting from solution of the refractory at horizontal joints. If the chemical composition of the refractory were adjusted so that no change in density of the molten glass is produced when the refractory is dissolved, corrosion might be decreased. A suitable ratio of alumina and silica might act in this way. Nine specimens of varying alumina-silica contents were fired to 1375°C. and then immersed in a platinum crucible containing glass at 1350°C. until sufficient corrosion had taken place. One series was run with soda-lime bottle glass, and a second with a 10% lead oxide glass. The results indicate that the change in density is not directly related to the corrosion, and its importance is probably insignificant in comparison with other factors, such as thermal currents. 3 references, 1 photo. A.P.

Sighting panel increases efficiency of Navy Corsairs. ANON. *Bull. Amer. Ceram. Soc.*, **24** [4] 121 (1945).—A bullet-resistant glass panel developed by the Libbey-Owens-Ford Glass Co., Toledo, Ohio, is used directly as a gun-sight reflector. It is 1.5 in. thick and weighs approximately 50 lb.

Silica aerogel. ANON. *Chem. Trade Jour.*, **112**, 456 (1943); abstracted in *Trans. Brit. Ceram. Soc.*, **42** [9] 77A (1943).—The method of manufacture is outlined. Silica aerogel is a light, friable, opalescent solid containing as much as 95% of air by volume; the bulk density may be as low as 1.8 lb. per cu. ft., and the product is a very effective heat insulator.

Sintered glassware. I. C. P. SMITH. *Jour. Inst. Petroleum*, **30**, 385–87 (1944).—British-made sintered glassware is now available in seven porosities with pore sizes ranging from 1 to 500 microns. Disks up to 6 in. in diameter are made. It is of great value in assisting agitation and emulsification. Cleaning should be carried out by reverse filtration at not over 14 lb. pressure, and then chemical means should be employed. 6 figures. W.D.F.

Substitute materials in modern glass manufacture. L.

SPRINGER. *Chem.-Ztg.*, **67**, 100–102 (1943); abstracted in *Chem. Zentr.*, **1943, II** [3] 260.—Soda is replaced by sulfate, alkali-containing minerals, soda slag, and cullet, and substitutes for litharge are baryta and zinc oxide. There exists no universal substitute material for borax and boric acid; on a small scale, Sioto and Flux V26 are recommended. It is also difficult to replace opacifiers (natural and artificial cryolite, sodium fluosilicate, fluorspar) and colorizing and decolorizing agents. M.HA.

Supreme Court hands down its decision. JOSEPH F. SHARP. *Glass Ind.*, **26** [2] 69–71, 93–94, 97 (1945).—On Jan. 8, 1945, the Supreme Court handed down its decision in the case involving the principal companies in the glass container industry. Its forty-page opinion reviewed the early history of the principal corporate defendents and their relationships to each other and gave directions for the entry of a decree which would prevent repetition of any wrongs that had been committed and dissipate the consequences of such wrongs. A.P.

Survival of U. S. handmade glassware depends on tariff protection. H. L. DILLINGHAM. *Glass Ind.*, **26** [1] 25–28, 38, 42; [2] 79–80, 89 (1945).—D. presents factual data and the history of tariff regulations and trade agreements affecting the U. S. handmade table and illuminating glassware industries. Actual effects of tariffs are debated from the standpoint of American labor and manufacturers. A.P.

Utilization of sulfate in the batch of mechanized glassworks. A. YA. GRINBERG AND M. D. REINHERTS. *Legkaya Prom.*, **1** [4] 28–29 (1941); abstracted in *Chem. Zentr.*, **1943, I** [21] 2229.—As the use of sodium sulfate for the batch of bottle glass is too expensive, it is proposed that sodium sulfate be converted into sodium silicate by adding quartz sand before it is added to the batch and that the silicate then be worked with the other components of the glass. A comparison of the economies of both methods is made. M.HA.

PATENTS

Apparatus for applying mats to battery plates. C. G. STAELIN (Owens-Corning Fiberglas Corp.). U. S. 2,373,082, April 3, 1945 (June 18, 1942). 4 claims. (Cl. 154-41).

Apparatus for bending glass sheets. L. J.-B. FORBES AND G. W. T. BIRD (Soc. Anon. des Manufactures des Glaces & Produits Chimiques de St.-Gobain, Chauny & Cirey). U. S. 2,372,418, March 27, 1945 (Jan. 23, 1939; in Great Britain Jan. 29, 1938). 1 claim. (Cl. 49–67).

Apparatus for forming batch bodies. G. W. BATCHELL. U. S. 2,371,213, March 13, 1945 (June 17, 1939; June 23, 1942). 4 claims. (Cl. 49–54).

Apparatus for manufacturing bonded fibrous mats. DALE KLEIST (Owens-Corning Fiberglas Corp.). U. S. 2,373,077, April 3, 1945 (June 13, 1942). 3 claims. (Cl. 154-27).

Apparatus for shaping elliptical glass tubes. JAKOB DICHTER (vested in the Alien Property Custodian). U. S. 2,371,881, March 20, 1945 (March 6, 1941; in Germany Jan. 11, 1940). 5 claims. (Cl. 49-7).

Binders for glass-fiber threads. HANS STEINBOCK (vested in the Alien Property Custodian). U. S. 2,371,933, March 20, 1945 (July 12, 1939; June 17, 1941; in Germany July 14, 1938). 5 claims. (Cl. 106–132).—4. A binder and lubricant for glass-fiber strands comprising a dilute aqueous emulsion containing 3 to 5% fatty acid sulfonate, 3 to 5% gelatine, and 3 to 5% of an emulsive substance selected from the group consisting of oils, fats, and waxes as a lubricant.

Composite glass-metal alloy article. W. E. KINGSTON (Sylvania Electric Products, Inc.). U. S. 2,371,627, March 20, 1945 (April 25, 1939; Aug. 9, 1939). 1 claim. (Cl. 49–92 5).

Curved glass surface and method and means for manufacturing. VICTOR WALKER (AlnCin, Inc.). U. S. 2,372,535, March 27, 1945 (Oct. 31, 1941). 14 claims. (Cl. 41-42).

Glass-blowing machine. R. G. ALLEN (Owens-Illinois Glass Co.). U. S. 2,372,642, April 3, 1945 (Jan. 7, 1942). 29 claims. (Cl. 49-5).

Glassmelting furnace with a connection between the melting and working chambers. V. P. SUROVTSEV. Russ. 58,563, Dec. 31, 1940; *Chem. Abs.*, **39**, 1033 (1945).—Constructional details.

Glassmelting furnace with a narrow cooling section. V. S. YAKOPSON. Russ. 58,543, Dec. 31, 1940; *Chem. Abs.*, **39**, 1033 (1945).—Constructional details.

Glass-tempering apparatus. J. K. JACKSON (Corning Glass Works). U. S. 2,372,898, April 3, 1945 (Jan. 11, 1940). 2 claims. (Cl. 49-45).

Guide for glass and like fibers. DALE KLEIST (Owens-Corning Fiberglas Corp.). U. S. 2,373,078, April 3, 1945 (Feb. 16, 1943). 9 claims. (Cl. 91-43).

Joining of ceramic bodies with metal bodies. R. SCHARFNAGEL. Ger. 731,753, Jan. 21, 1943 (Cl. 80b. 23.01); addition to Ger. 680,064 (*Ceram. Abs.*, **19** [11] 272 (1940)); abstracted in *Chem. Zentr.*, **1943, I** [21] 2230.—The binder described in Ger. 680,064, melting at 900° to 1000°C., is used in such manner that the melting process is divided in two stages; metal and binder are joined in a reducing atmosphere, and then the ceramic body is melted onto the binding metal already adhering to the metal body under access of air. M.HA.

Method and apparatus for grinding lenses. BENJAMIN LIEBOWITZ. U. S. 2,371,303, March 13, 1945 (Sept. 18, 1942). 13 claims. (Cl. 51-111).

Producing abrasives. A. F. TURNER (Bausch & Lomb Optical Co.). U. S. 2,371,786, March 20, 1945 (May 31, 1943). 4 claims. (Cl. 51-293).—1. The method of forming an abrasive and polishing compound comprising the steps of evaporating an abrasive-forming material in an evacuated space in close proximity to a surface of a transparent body so that vapors from the material may condense thereon; discontinuing the evaporation of the material after light ray interference bands indicative of a desired thickness of distilled material are discernible through the transparent body; and thereafter removing the distilled material from the surface.

Producing optical surfaces, etc. VICTOR WALKER (AlnCin, Inc.). U. S. 2,372,536, March 27, 1945 (May 8, 1942). 11 claims. (Cl. 41-42).

Reduction in reflection from glass. G. L. DIMMICK (Radio Corp. of America). U. S. 2,371,611, March 20, 1945 (Feb. 28, 1942). 10 claims. (Cl. 88-1).—1. An optical element having a refracting surface and a reflection-reducing coating thereon having a thickness of approximately one-quarter wave length of the light for which maximum reflection reduction is to be produced and comprising evaporated and deposited calcium fluoride–aluminum fluoride eutectic.

Separating glass sheets, etc. J. A. MCCORMICK, JR. (Dearborn Glass Co.). U. S. 2,372,215, March 27, 1945 (Nov. 29, 1941). 4 claims. (Cl. 49-77).

Thin glass sheets. PATENTVERWERTUNGS G.M.B.H "HERMES." Belg. 447,203, Oct. 31, 1942; *Chem. Abs.*, **39**, 1033 (1945).—Materials that improve the quality of liquid glass by reduction of its surface tension and viscosity are brought into contact with the glass. These materials can be reducing vapors or gases, atomized liquids (hydrocarbons), or solid powders (paraffin, etc.) and can be brought into contact with the glass by blowing or through the flame of the melting furnace, by sprinkling on the surface of the bath or of the glass ball during blowing, during subsequent heat-treatment of the finished glass sheets, or by any suitable combination of these methods. The rate of blowing may be increased in proportion to the decrease in viscosity, and high-grade glass sheets 1 to 2 microns thick for electrical insulation can be obtained.

Vitreous insulator. A. L. C. DELLOYE (vested in the Alien Property Custodian). U. S. 2,371,880, March 20, 1945 (Nov. 16, 1940; in France Oct. 2, 1939). 5 claims. (Cl. 154-44).—1. An insulating material for heat, sound, or both, consisting of threads of glass of a short and substantially uniform length and forming a mixture in which the ratio between the quantity of threads of glass and the quantity of air per unit of volume interposed between these threads is practically constant.

Structural Clay Products

Back travel. ANON. *Brit. Clayworker*, **52** [616] 59 (1943); abstracted in *Trans. Brit. Ceram. Soc.*, **42** [11] 114A (1943).—Incorrect placing of the blades in a brick machine is a cause of back travel. The blades having the greatest propelling power are those which form a complete screw thread about the shaft. Where the blades are arranged so as to mix the clay and not propel it, a little backward motion of the clay is advantageous because it ensures a more homogeneous product. Imperfect mixing of the clay and irregular feeding of the machine are causes of back travel. With fat and slippery clay that works backward even with well-designed blades, a small pair of rolls should be placed above the machine where the backward motion of the clay is noticeable. These rolls, driven mechanically, force the clay downward and prevent its backward movement. Two arrangements are illustrated, one with a single roll and the other with a pair of rolls. Temporary relief may sometimes be effected by placing a board between the open side of the machine and the crushing rolls.

Splitting of soft-mud brick. H. G. SCHURECHT AND J. F. MCMAHON. *Jour. Amer. Ceram. Soc.*, **28** [4] 118-20 (1945).—3 figures.

PATENTS

Wall construction. R. D. WELLS (Wells Co., Inc.), U. S. 2,371,201, March 13, 1945 (March 8, 1941). 5 claims. (Cl. 72-38).—3. A wall structure composed of building blocks defining two tiers disposed in spaced, parallel relationship.

Refractories

Alumina from low-grade bauxite. ANON. *Chem. Trade Jour.*, **113,** 60 (1943); abstracted in *Trans. Brit. Ceram. Soc.*, **42** [10] 95A (1943).—The bauxite is wet ground and digested with soda ash and lime; the suspension is then thickened, washed, and filtered.

Arc-furnace melting. N. F. DUFTY. *Metal Treatment*, **7** [28] 138–40, 142 (1941).—D. comments on refractories, charging, furnace practice, power input, and equipment from the viewpoint of metallurgical and economic efficiency in arc-furnace melting. See *Ceram. Abs.*, **22** [2] 32 (1943). M.A.S.

Arc-furnace refractories. NORMAN F. DUFTY. *Jour. West Scot. Iron Steel Inst.*, **51** [3] 35–42 (1943–1944).—Although the ultimate ideal is a basic roof for a basic furnace, it is not yet a practical proposition. Silica provides a satisfactory service for arc roofs providing the roof is well designed and the brick have a low (<10%) quartz content. When used in a basic furnace, sillimanite refractories absorb lime and soon become susceptible to spalling. Where severe spalling conditions are met, firebrick or sillimanite may give a much better life than silica. The use of magnesite, chrome, metal-cased magnesite, and dolomite brick in side walls is discussed. Dolomite is generally used in hearths. The method of burning in a bottom and maintaining it is discussed. Wartime conditions have required a substitution of dolomite for magnesite. See *Ceram. Abs.*, **22** [2] 32 (1943). B.C.R.

Blast-furnace design in operation. JAMES DALE. *Jour. West Scot. Iron Steel Inst.*, **51** [4] 45–106 (1943–1944). B.C.R.

Development of basic open-hearth roofs. R. P. HEUER. *Proc. Natl. Open Hearth Conf., Amer. Inst. Mining Met. Engrs.*, **27,** 337–39 (1944).—Future improvements necessary are (1) better spalling resistance, (2) better roof design, and (3) better furnace operation. Basic refractories have a high coefficient of expansion and should be kept at a more uniform temperature. W.D.F.

General surveys of refractories for electric furnaces. R. P. HEUER. *Proc. Elec. Furnace Steel Conf., Amer. Inst. Mining Met. Engrs.*, **1,** 53–57 (1943).—For bottoms, a rammed magnesite mixture is used; a special binder is added by the manufacturer, and nothing else is needed. The amount of binder should be kept at a minimum for maximum durability. The ramming mixture should contain 80% magnesia. The material must be sized and rammed to make the bottom as dense as possible. The magnesite grains must be nonporous, which is achieved by proper preparation and firing at a high temperature. Side walls for basic furnaces may be either silica or basic brick. The latter is gaining in favor. Steel-clad brick is much used. The composition is magnesite plus 20% chromite, to give better volume stability. Chrome ore containing only 30% chromic oxide may be used. Sometimes as high as 75% chrome ore is needed. Roofs for basic furnaces are generally silica brick, but the furnace operates near its melting point and the best grades of silica brick are needed. Superduty fire-clay brick are sometimes used on intermittent furnaces; they have a P.C.E. of 3200°F. Brick with 60% Al_2O_3 may be used but shrinks badly at the highest temperature. Sillimanite brick are also used. Basic brick are rather expensive. Induction furnaces use acid, neutral, and basic refractories. The acid lining is useful when acid melting conditions are satisfactory; neutral linings have limited use. A basic lining is desirable metallurgically but difficult to make. One type has 60% MgO and 40% Al_2O_3. W.D.F.

Increased blast-furnace capacity and how accomplished. G. T. WILLIAMS AND B. M. STUBBLEFIELD. *Blast Furnace Steel Plant*, **31,** 645 (1943); abstracted in *Trans. Brit. Ceram. Soc.*, **42** [10] 106A (1943).—Methods are described for reducing the time taken to carry out repairs. The normal time for a complete relining is 60 days, but this has been reduced to 40 days or even less. This reduction has been achieved by draining the salamander iron, precutting the hearth blocks outside the furnace, and building the lining from the bottom to the mantle and from the mantle to the top simultaneously.

Installation of basic open-hearth roof. H. S. FRANK. *Proc. Natl. Open Hearth Conf., Amer. Inst. Mining Met. Engrs.*, **27,** 334–37 (1944).—The roof on the 100-ton furnace is 13.5 in. thick, and that on the 180-ton furnace is 22.5 in. thick; both have ribs. The average number of heats is 169. The average roof cost is 19¢ per ton. The average campaign length is 146 days. No chances are taken with a dropped roof, so the life does not approach the maximum possible. A suspended basic roof is used because of less patching and higher pouring temperatures. The basic roof tends to spall at 2000°F. but stands 3400°F. Basic-roof cost is three times as much, but this is equivalent to only two days of operation cost. Unburned Kembond and burned Kromag brick are used. An average of 18 tons more steel is made per day, and fuel consumption is less. W.D.F.

Insulation of open-hearth furnaces and blast furnaces, with special reference to heat losses and their reaction. J. M. FERGUSON. *Iron & Coal Trades Rev.*, **150** [4016] 245–47; [4017] 280–82, 289 (1945).—The possibility of reducing the large heat losses by an increase in the use of insulating materials is thoroughly discussed. A table shows the radiation losses at different parts of the furnace and the effects of heat insulation. The fuel consumption was improved, 7.85 therms per ton being saved, which was 11.8% of the producer fuel cost. Special insulation should not be applied to open-hearth roofs, but an appreciable saving can be obtained by increasing the roof thickness. In furnace hearths of dolomite brick, no insulation should be used, and the maximum thickness of the firebrick shaping courses should be carefully calculated. Hearth insulation would impose increased thermal pressure on the refractories, and the saving would be very small. Insulation is beneficial for uptakes, slag-pocket arches, producer-gas mains, foundations of regenerators, and regenerator-chamber walls and dam walls. The application of insulation requires more substantial sup-

porting structures, such as roof binders, buckstaves, etc. Insulation is provided by three classes of material: (1) high-temperature insulating brick, for use from over 1600° to 2450°F., (2) low-temperature insulating brick, for use below 1600°F., and (3) loose insulating materials, for use at temperatures below 1600°F. Insulation of furnaces of older design is not considered favorable, as insulation should be an integral part of the design and early provision should be made for its incorporation. The saving in blast furnaces by insulating hot-blast mains and bustle pipe amounted to 5.68 therms per hr. M.HA.

Kyanite. ANON. *Crown Colonist*, Nov., 1943; abstracted in *Trans. Brit. Ceram. Soc.*, **42** [11] 111A (1943).—Kyanite occurs in Kenya, Nyasaland, and Uganda; samples are under test with a view to working the material for the refractories industry.

Magnesia from sea water. C. H. DESCH. *Jour. Roy. Soc. Arts*, **91**, 273 (1943); abstracted in *Chem. Trade Jour.*, **112** [2910] 189–91 (1943).—The production of magnesia from sea water by two companies (British Periclase, Ltd., and Ocean Salts, Ltd.) in Great Britain is described in detail. Ten million gallons of sea water is used per day by the former company. The sea water is treated first in tanks with a little lime to precipitate the dissolved calcium bicarbonate. Calcined dolomite, slaked with water and screened through 72-mesh, is sprayed as milk onto the surface of the sea water in large tanks. The yield of magnesia is doubled by the use of dolomite. The manner of mixing is important, as it controls the character of the precipitate. The $Mg(OH)_2$ is settled, aided by a revolving thickener, so that the slurry drawn off is of constant concentration. It is pumped to screens and steam heated to facilitate filtering, which is done through cotton vacuum filters, from which the magnesia falls as a cake. This is extruded and fed to rotary kilns, similar to those used in cement manufacture. Ocean Salts, Ltd., uses pure lime instead of calcined dolomite as a precipitant. An entire plant is devoted to dead-burned magnesia for refractories. The Dow Co. plant at Freeport, Texas, is briefly described (*Ceram. Abs.*, **24** [4] 74 (1945)). The method used in Great Britain for extracting magnesium metal is also described. L.R.B.

Making special refractories. ANON. *Australian Manuf.*, March 27, 1943; abstracted in *Trans. Brit. Ceram. Soc.*, **42** [10] 104A (1943).—A brief outline of the manufacture of firebrick and retorts at the plant of the Darley Firebrick Co., Victoria, is given.

Modern refractories for the electric melting furnace. EDWARD K. PRYOR. *Proc. Elec. Furnace Steel Conf., Amer. Inst. Mining Met. Engrs.*, **1**, 59–62 (1943).—There appears little likelihood of the development of any entirely new refractories in the near future, but those now in use will be improved. Tonnage refractories will have to be made from silica, alumina and silica, magnesite, chrome, and dolomite. A clayless silica mortar with good working properties is available. Kyanite or sillimanite refractories resist thermal shock and are used in roofs, door arches, and jambs. Water cooling causes a steeper temperature gradient in the brick. Refractories are poor heat conductors, so the steep temperature gradient is not near the hot face and refractory destruction continues unabated until near the water, when the refractory must be discarded anyway. Maintenance begins and to a great extent ends with the selection of a suitable refractory and its proper installation. W.D.F.

Panel tests for thermal spalling of fire-clay brick used at high temperatures. R. A. HEINDL AND W. L. PENDERGAST. *Jour. Research Nat. Bur. Standards*, **34** [1] 73–96 (1945); RP 1630. Price 15¢ from Supt. of Documents, Washington, D. C.—Sixteen brands of fire-clay brick of the superduty class, 28 of the high heat duty, and 6 of the intermediate heat duty classes supplied by 19 manufacturers were tested primarily for resistance to spalling by the panel test method of the American Society for Testing Materials. Variations of this method included tests of panels of specimens in all-header construction and of combinations of stretcher and header construction. The gas pressures in the furnace were controlled to nominal 0.2, 0.4, and 0.6 in. of water. For the superduty brick preheated at 1650°C. with the furnace gas pressure maintained at 0.4 in. of water, 12 of the 14 brands tested in all-stretcher construction and 9 of the 14 tested in all-header construction had losses of less than 4%. For the high heat duty brick preheated at 1600°C. with the furnace pressure maintained at 0.4 in., 16 of the 26 brands tested in all-stretcher construction had spalling losses of less than 5%. For the intermediate heat duty brick preheated at 1500°C., the spalling losses were low for 5 of the 6 brands tested. Although there were exceptions, spalling losses increased for a majority of brands with increase in the gas pressure maintained in the furnace during the preheating. In the first of two general types of spalling, large pieces of the specimen spalled conchoidally but remained in position until the brick were removed from the panel or scraped with a trowel. In the second type, the spalled pieces were small and angular and frequently dropped spontaneously during the heating and cooling cycles. A relation of possible value was noted between the spalling loss of the tested specimen as removed from the panel and the total loss after scraping with a trowel to remove adhering kaolin. On the basis of that relation it would be possible to set specification limits on spalling in terms of loss of the unscraped specimen that would be as satisfactory as the present terms of loss by scraping, and the personal factor would be largely eliminated. For the superduty class of brick, 11 of the 16 brands tested had expanded after having been reheated at 1600°C. for 5 hr., but in only 3 cases were the linear expansions greater than 2.5%. Results of tests on volume changes were more dependable than those on linear changes because of distortions that may occur in the specimens during reheating. In exceptional cases only was there a tendency for the firebrick to have decreased linear and volume changes with increase in the furnace pressure from 0.05 to 0.6 in. of water. The absorptions of the superduty class of firebrick as received ranged from 4.5 to 11.3%, and bulk densities from 129 to 152.2 lb. per ft.^{3}; P.C.E. was 33 or above. Reheating at 1600°C. for 5 hr. caused the absorption to decrease for all brands except the 3 that had great increases in volume. Furnace pressure had no significant effect on the absorption. For the 10 brands of high heat duty brick tested, there was little change caused by reheating at 1400°C. for 5 hr. in either volume or absorption. Since 3 of these brands had marked shrinkage in panels preheated at 1600°C., it may be concluded that reheating at 1400°C. is of little consequence. The absorptions for the specimens as received ranged from 7.3 to 15.8%. When specimens of the high-heat duty brick were tested as 4.5-in. stretchers, the spalling loss tended to be greater than when they were tested either as headers or as 9-in. stretchers. When 2 headers were bonded with an air-setting mortar and tested as a 9-in. specimen, the spalling loss approached that of the 9-in. stretcher, but after the mortar joint was broken the loss approached that of the header. Although there are exceptions, the tendency is for the test specimens to have greater spalling losses as the number of joints in the brick panel is increased. The tendency for the loss for headers to be greater than that for stretchers, however, may have resulted from the differences in extensibility in the two directions of the brick. The results of this investigation make it appear desirable, in any proposed Federal Specification for fire-clay brick in which the panel test is specified, that consideration be given to limits for spalling loss based on brick laid as stretchers and as headers, a controlled atmosphere, and the gas pressure in the furnace chamber during preheating. R.A.H.

Present-day refractories for the electric melting furnace. C. A. BRASHARES. *Proc. Elec. Furnace Steel Conf., Amer. Inst. Mining Met. Engrs.*, **1**, 57–59 (1943).—The advantage of high silica ramming mixtures for bottoms is the high periclase content produced. For acid bottoms, the grain size of the ganister must be controlled, and the minimum amount of clay must be added. Metal-enclosed magnesite brick are being used more in basic furnaces. Silica brick used in the side wall must be of high quality. Hard-burned magnesite brick are used in some doors.

Silica brick in the roof need a mortar of the same refractoriness, which is available. Continuous operation makes silica brick in the roof preferable to superduty fire-clay brick. Bottoms should be properly maintained by careful placing of repairing material. Silica roofs must not be heated too fast. W.D.F.

Production of lightweight refractories and superrefractories by the frothing method. A. A. PIROGOV. *Ogneupory*, **1936**, No. 4, p. 260; abstracted in *Trans. Brit. Ceram. Soc.*, **42** [10] 104A (1943).—Lightweight refractories are made from nonplastic materials (quartzite, chromite, magnesite, corundum, etc.) by a frothing method using a colloidal foaming agent. A highly grogged suspension containing only a very small proportion of plastic material must be used to avoid deformation and to produce a good texture. See "Lightweight...," *Ceram. Abs.*, **18** [5] 131 (1939); "Production. . . ," *Ceram. Abs.*, **24** [4] 74 (1945) "Semiproduction . . .," this page.

Production, melting, and casting of magnesium. J. P. JONES. *Foundry Trade Jour.*, **70**, 94 (1943); abstracted in *Trans. Brit. Ceram. Soc.*, **42** [10] 106A (1943).—An open silica sand is generally used with a binder of the bentonite or fuller's earth type. Moisture must be reduced to a minimum, i.e., a maximum of 5%, and either into the sand or into the completed mold an inhibitor must be introduced; such inhibitors are commonly mixtures of B_2O and S or $(NH_4)HF_2$. Mild steel pots are used for melting Mg, as there is a tendency for Mg to react with the silicon in the plumbago type usually used in nonferrous work.

Rammed monolithic basic brick lining for doors (discussion). GEORGE W. COSSETT ET AL. *Proc. Natl. Open Hearth Conf., Amer. Inst. Mining Met. Engrs.*, **27**, 342–43 (1944).—One company had a decrease in the annual average number of heats from 180 to 150 to 126. Another company averaged 50 to 72 heats, while still a third company used a water-cooled door and obtained 571 heats. W.D.F.

Recent improvements in stopping blast-furnace tapholes. A. G. AREND. *Metallurgia*, **27**, 232 (1943); abstracted in *Trans. Brit. Ceram. Soc.*, **42** [8] 75A (1943).—Improved mechanism for stopping blast-furnace tapholes is discussed. Attention is directed to its automatic adjustment, its efficiency in coping with difficulties encountered in this operation, and the reduction in risk to operators by its use.

Refractory concrete for furnace construction. GERALD T. HADDOCK. *Metals & Alloys*, **21** [2] 395–400 (1945).—Advantages resulting from the use of a refractory concrete include (1) elimination of joints, (2) ability to cast intricate units in place, and (3) freedom in the selection of size and shape of sections. Portland cement is limited to temperatures below 500°F., and heat-resistant concrete to <1400°F. Refractory concrete utilizes calcium aluminate cements (Lumnite) for obtaining initial set and a reaction between the Lumnite and the fine aggregate to provide a ceramic bond above 1500°F. Factors concerned in strength characteristics of a refractory-concrete installation are as follows: (1) The effective strength of the wall is the total strength across the section. (2) The plane of low strength depends on the temperature gradient through the section. (3) The fired strength depends on the nature of aggregate, proportions of mix, and service temperature. (4) The strength after heating is less than the original cold strength of the concrete. Compositions of various types of concrete are discussed. B.C.R.

Semiproduction trials on the manufacture of insulating refractories by the frothing method. A. A. PIROGOV, A. ROĬZEN, AND L. BILSON. *Ogneupory*, **1937**, No. 5, p. 100; abstracted in *Trans. Brit. Ceram. Soc.*, **42** [10] 105A (1943).—The foam is stabilized with 0.25% each of resin and glue and is cast into brick. The products of different batches had porosities of 58 to 78% and crushing strengths of 525 to 2630 lb. per sq. in. Under a load of 14 lb. per sq. in., subsidence commenced at 1270° to 1370°C. See "Production. . . ," this page.

Special refractories (discussion). GEORGE W. COSSETT ET AL. *Proc. Natl. Open Hearth Conf., Amer. Inst. Mining Met. Engrs.*, **27**, 345–46 (1944).—An experimental batch of mullite roof brick was put in when the roof had to be patched. At the end it stuck out 7 in. further than the silica and was exposed to the flame on all sides. It showed very little iron oxide penetration. Mullite advantages are (1) higher fusion point, (2) higher softening point, (3) absence of spalling, (4) almost complete impermeability to iron oxide, (5) lower heat conductivity, and (6) lack of critical expansion. Disadvantages are (1) double weight, (2) greater cost (4 times as much), and (3) lack of experience in use. Silicon carbide was used on part of a roof. After 112 heats the silica brick fell, leaving the silicon carbide brick in place. After 90 more heats they began to wear quite badly; they are also too highly heat conducting. W.D.F.

Swedish standard specifications for steel-pouring refractories. *Jernkontorets Ann.*, **126**, 358 (1942); abstracted in *Trans. Brit. Ceram. Soc.*, **42** [10] 105A (1943).—The Jernkontorets standard dimensions for sleeves, stoppers, nozzles, runner brick, and other casting-pit accessories are tabulated.

Thermal conductivity of carbon blacks. W. R. SMITH AND G. B. WILKES. *Ind. Eng. Chem.*, **36** [12] 1111–12 (1944).—The thermal conductivity of three samples of commercial carbon black was measured. It appears to be independent of the ultimate particle size and, in two samples, is lower than that of still air. Agglomeration of carbon black into free-flowing pellets increases the conductivity to a value slightly higher than that of still air. Illustrated. F.G.H.

Tropenas converter practice. E. C. PIGOTT. *Metallurgia*, **28**, 81, 139 (1943); abstracted in *Trans. Brit. Ceram. Soc.*, **42** [10] 106A (1943).—To enable repairs to be carried out, the converter is operated only on alternate days. Ganister is used for patching, and the lining must be carefully dried. Before being charged, the converter should be taken to a white heat.

Water cooling to lengthen brick life. W. R. MCLAIN. *Proc. Natl. Open Hearth Conf., Amer. Inst. Mining Met. Engrs.*, **27**, 339–40 (1944).—Water cooling is used in the front part of the furnace for doors, frames, roof, skewback channel, buckstays, skewback tanks, bridge walls, and monkey walls and in the back for the roof skewback channel, bridge walls, monkey walls, and slag hole. The ends have cooling in the port tank, end wall below floor, burner, and keyhole tank. At the beginning of a run 14% of the British thermal units went to the water, and after 400 heats 40% went to the water. Front-wall life has been increased 50%. W.D.F.

PATENTS

Making alkali metal aluminate. E. E. FISHER (M. W. Fisher). U. S. 2,372,819, April 3, 1945 (Aug. 1, 1941). 7 claims. (Cl. 23-52).

New refractory and insulating material. LA FLORIDIENNE J. BUTTGENBACH & CO., SOC. ANON. Belg. 445,582, Nov. 30, 1942; *Chem. Abs.*, **39**, 1034 (1945).—A porous alkali silicate is intimately mixed with SiO_2 in the presence of a coagulant, such as concentrated HCl. After coagulation, the excess water is removed, and the product is heated for 24 hr. between 200° and 450°. The block thus obtained can be sawed into plates.

Refractory composition. EUGENE WAINER (Titanium Alloy Mfg. Co.). U. S. 2,372,236, March 27, 1945 (Sept. 27, 1941). 21 claims. (Cl. 106-55).—1. A dry solid refractory composition containing a major portion of refractory aggregate, a minor portion of a halide of low hygroscopicity, a minor portion of a nonhygroscopic acid salt, and a minor portion of a nonhygroscopic substance capable of reacting with the acid salt, the substance being taken from the class consisting of magnesia and metal oxide and nonmetal oxide derivatives of zirconium oxide.

Refractory mass intended to be tamped. DIDIER-WERKE A.-G. Belg. 446,701, Sept. 30, 1942; *Chem. Abs.*, **39**, 1034 (1945).—Small quantities (3%) of pulverulent alkali titanosilicate are added to the granular refractory mass.

Refractory material. I. S. SMELYANSKIĬ. Russ. 58,324, Nov. 30, 1940; *Chem. Abs.*, **39**, 1034 (1945).—A refractory

material is prepared from the usual materials, except that, instead of CaO, the binder is a powdered quartz mineral, e.g., marshalite.

Refractory material. ZAVOD MAGNEZITOVYKH IZDELIĬ "MAGNEZIT." Russ. 58,338, Nov. 30, 1940; *Chem. Abs.*, **39**, 1034 (1945).—A mixture of Fe ore, fine-ground, dead-burned magnesite, and coarse-grain chromite is molded, dried, and fired.

Whiteware

Ball clay investigation: Symposium III. RALSTON RUSSELL, JR., *Chairman. Bull. Amer. Ceram. Soc.*, **24** [4] 122–38 (1945).—9 references. For Symposia I and II see *ibid.*, **21** [11] 248–91 (1942); **23** [2] 47–53 (1944).

Fuel problems licked, potters now face lead shortage. ANON. *Ceram. Ind.*, **44** [2] 71–72 (1945).—At the annual meeting of the U. S. Potters Assn., Jan., 1945, Pittsburgh, the need for leadless glazes was emphasized. H.T.

New superior high-frequency insulation. ANON. *Westinghouse Engr.*, Jan., 1945; reprinted in the booklet "Westinghouse Engineering Highlights," pp. 30–31 (Jan., 1945).—The war production program for ultrahigh-frequency signaling equipment has run ahead of the supply of steatite porcelain at times. A new material developed for this use, zircon porcelain, is superior in several ways to steatite, especially in loss factor at high frequencies. It is 37% better than commercial electrical porcelain in tensile strength, 15% better in compressive strength, and approximately 30% better in resistance to transverse blows. It is more impervious to moisture and is decidedly better in resistance to heat shock. C.S.P.

Onondaga plant, where ceramic land mines were made. ANON. *Ceram. Ind.*, **43** [6] 66–70 (1944).—The Court Street plant of the Onondaga Pottery Co. is described. The plant has been reconverted to the manufacture of hotel ware and thin translucent dinnerware, after completing a contract for all-ceramic land mines. 25 photos. See *Bull. Amer. Ceram. Soc.*, **23** [9] 331; [10] 397 (1944). H.T.

Prestite: improved method for molding electrical porcelain. E. H. FISCHER. *Trans. Electrochem. Soc.*, **83**, 187 (1943).—The new method makes use of specially sealed metal dies which are evacuated down to within 2 cm. or less. See *Ceram. Abs.*, **21** [1] 18 (1942). F.G.H.

Problem of bisque defects. ANON. *Ceram. Ind.*, **43** [6] 72, 74 (1944).—Bisque defects are analyzed for possible correction. Establishing a "defect morgue" simplifies the tracing of faults. 4 photos. H.T.

Semiautomatic jigger increases output per man-hour. HAROLD F. ALLEN. Presented to the Ceramic Assn. of New Jersey, New Brunswick, Dec., 1944; abstracted in *Ceram. Ind.*, **44** [2] 78–80, 85 (1945). H.T.

SEPARATE PUBLICATIONS

American Standard Insulator Tests, C29.1-1944. Published by American Standards Assn., 70 East 45th St., New York 17, N. Y., 1945. 22 pp., 5 figures. Price 40¢.—The revision of American Standard Insulator Tests, C29a-1930 has now been completed and formally approved. These standards comprise a manual of procedures for tests to determine the characteristics of insulators used on electric power systems. They do not cover test procedures for apparatus bushings. They are not intended as complete insulator specifications but rather as test procedures for incorporation in such specifications.

Final Report No. III on Shrinkage Control of Steatite Porcelain for Radio and Radar Equipment: I, Development of a System of Shrinkage Control for Extruded Steatite Bodies. R. L. STONE. *War Production Board—46, Office of Production Research and Development—226*, Jan. 1, 1945. 45 pp.—The principal factors causing poor shrinkage control of extruded steatite were found to be (1) variations in the moisture content of the body at the time of extrusion, the variations being caused by (*a*) poor control of moisture at the mixers, (*b*) loss of moisture during storage and handling of the plastic body, and (*c*) loss of moisture during evacuation; and (2) variations in the characteristic fired specific gravity produced by the talcs. The first of these is the cause of batch-to-batch variations, and the second is responsible for shipment-to-shipment variations. Firing temperatures above that which produce zero dye absorption, absolute evacuation pressures of less than 2 in. of mercury, and pH with limits of ±0.02 have little effect on the shrinkage. Dry diameters of extruded shapes are affected principally by the moisture content, which must be held to less than ±0.2%. **II, Development of Special Bodies for Production of Electron Tube Spacers.** 34 pp.—Bodies were prepared in which the mixing water was partially or wholly replaced by one or more of the following: diethylene glycol, methyl amyl acetate, and triethanolamine. Extrusion bodies bonded with gum ghatti and containing 1 part water to 1 part of triethanolamine produced extremely strong bodies when dried progressively at 150°, 250°, and 350°F. Partial replacement of the mixing water by diethylene glycol and methyl amyl acetate produced variable results. The following investigations are also reported: (1) effects of evacuation of the die cavity during dry pressing, (2) effects of the $BaO:CaO:Al_2O_3$ ratio on the physical and electrical properties of steatite bodies, (3) development of porous tube spacer bodies employing Canadian cryptocrystalline serpentine, (4) development of a body that would meet class L-6 specifications, and (5) possibilities of forming steatite shapes by repressing freshly extruded material. Evacuation during dry pressing produced absolute freedom from laminations and warpage due to entrapped air but did not improve electrical characteristics. Excellent class L-5 steatite bodies, all having the same firing temperature (2350°F.) are produced by mixtures of talc, clay, $CaCO_3$, and $BaCO_3$ so that the $BaO:CaO:Al_2O_3$ ratio lies within the limits of 2.10 BaO:0.25 CaO:1.50 Al_2O_3 and 0.35 BaO:1.70 CaO:1.50 Al_2O_3. Tube-spacer bodies composed entirely of serpentine have an exceptionally long firing range of over 100°F. and a loss factor of approximately 0.40% at 350°F. The incorporation of either clay or $BaCO_3$ in the serpentine bodies decreased both the firing temperature and the firing range but had little effect on the loss factor. Repressing pressures of 3000 lb. per sq. in. proved satisfactory. The repressing method is useful only as a method of obtaining pressed shapes having the vitreous structure of extruded ware. 27 figures, 10 tables. See *Ceram. Abs.*, **23** [10] 171–72 (1944). R.L.S.

PATENTS

Prevention of crazing of ceramic glazes. AUERGESELLSCHAFT A.-G. Belg. 447,440, Nov. 30, 1942; *Chem. Abs.*, **39**, 1034 (1945).—Zr compounds are added in a proportion, e.g., 1 to 5%, insufficient to opacify the glaze, the composition of which, e.g., SiO_2 and Al_2O_3 content, must be such that these compounds dissolve completely.

Production of ceramic insulating plates. N. V. PHILIPS' GLOEILAMPENFABRIEKEN. Belg. 442,513; abstracted in *Chem. Zentr.*, **1943, I** [26] 2717.—Intended for use for the electrodes of discharge tubes to obtain plates of absolutely definite thickness. M.HA.

Seger cones. D. I. SHCHEGOLEV. Russ. 59,242, Feb. 28, 1941; *Chem. Abs.*, **39**, 1034 (1945).—To make the deformation of the Seger cone more easily visible, the cone is covered with compounds of Ce or other materials that are luminescent at high temperatures.

Spark plug. L. McK. FIELD. U. S. 2,371,162, March 13, 1945 (Feb. 20, 1942). 11 claims. (Cl. 123-169).

Equipment and Apparatus

Automatic controls on periodic drier speed production of handmade refractory shapes. R. F. GRADY, JR. *Brick & Clay Record*, **102** [6] 41–43 (1943); abstracted in *Trans. Brit. Ceram. Soc.*, **42** [11] 115A (1943).—The capacity of the Malvern (Ark.) Brick & Tile Co. was doubled in 1941 without increasing the number of kilns or driers. This was achieved by installing control equipment. In the case of the driers, controlled humidity enables 230 cars of 12 x 12 x 18-in. hollow blocks to be dried in 8 hr. in a drier having a capacity of 176 cars. The control system permits any desired humidity schedule to be maintained for a drying cycle up to 6 days in length; it is operated by cams cut to a precalculated shape. The use of the single-pole triple-throw mercury switch permits the control of both the "over" and "under" wet- and dry-bulb temperatures. The wet- and dry-bulb temperatures are controlled individually. The dry-bulb controller operates a damper and a gas valve; the wet-bulb controller operates a water pump and a second damper. Other features of the plant are briefly mentioned.

Criteria of dust determination. S. C. BLACKTIN. *Chem. Age* [London], **49**, 575 (1943); abstracted in *Trans. Brit. Ceram. Soc.*, **42** [9] 92A (1943).—A detailed account is given of the instruments used for the determination of dust concentrations. See "Efficiencies. . . ," *Ceram. Abs.*, **23** [11] 194 (1944).

Dust counts and their significance. N. R. BERNZ. *Heating, Piping, Air Conditioning*, **14**, 361 (1942); abstracted in *Trans. Brit. Ceram. Soc.*, **42** [9] 93A (1943).—The midget impinger, microprojector, Owens jet, Bausch & Lomb dust counter, and the konimeter are discussed.

Glass tanks for pickling and plating. GEORGE L. WEST. *Metals & Alloys*, **21** [2] 413–16 (1945).—Heat-tempered plate glass (Herculite process) provides a satisfactory material for constructing pickling and plating tanks; resistance to thermal and impact shock is increased. Side walls of the tanks are fastened together with a noncorrosive metal and glass-cloth gaskets impregnated with a material determined by the solution in the tank. Carrara glass is used for the bottom. Large tanks are supplied with a steel or wooden shell. All-glass tanks are recommended for use where visibility is important. B.C.R.

Grain analyses of minerals of sand size in ball mills. HAROLD L. ALLING. *Jour. Sediment. Petrol.*, **14** [3] 103–14 (1944).—Progress in studying sedimentary rocks in thin sections would be greatly facilitated if the rates of change in the size, roundness, and sphericity of various minerals in rotating drums were determined by measuring size in diameters, not by screening, and the frequency by percentage of number, not by weight. These should be two-dimensional measurements. A start was made by crushing specimens of four minerals (quartz, microcline, tourmaline, and garnet), screened to sand size and rotated dry in glass bottles supplied with three ordinary marbles at 150 r.p.m. to a total of 180,000 revolutions, or 31.5 km. Small samples taken from these ball mills periodically via a microsplitter were measured microscopically. These data were slightly modified by smoothing and replotted as frequency-distribution curves and as cumulative curves. The roundness and sphericity of the grains were determined by direct comparison with patterns slightly modified from those of Krumbein and Rittenhouse. The results are shown graphically. The plotting of the data of the initial samples results in symmetrical frequency-distribution curves (bell shaped) with one peak. After a short time in the rotating ball mills, a secondary peak is developed in the small size ranges, and the primary peak is reduced and shifted toward small sizes. This increases the skewness and lowers the sorting. The originally angular grains become slightly rounded and the sphericity increases somewhat. Ultimately, the primary peak is destroyed and the secondary peak becomes dominant. The skewness at the start is close to zero, rapidly increases, and then slowly decreases. This characteristic is apparently a transitory condition, and it seems reasonable to suppose that it may be applied in some cases to natural sediments. The quartz is reduced in size at the fastest rate, the microcline next, followed by tourmaline, and last by garnet. The Mohs hardness does not seem to be the dominant or controlling factor. The brittleness of the quartz, the cleavage of the microcline, and the toughness of the other two seem to be influential. Very small grains are rarely rounded, the larger grains more. The degree of roundness, without specifying the size, means very little; the two are interrelated. These results are the product of mechanical abrasion, not of solution. In nature, solution is an additional process in size reduction, roundness, etc. G.M.H.

Nickel and Inconel thermocouple protection tubes. E. M. KLINE AND A. M. HALL. *Metals & Alloys*, **21** [2] 401–403 (1945).—The use of nickel and Inconel thermocouple protection tubes in cyanide, lead, and salt baths and in reducing-atmosphere applications is discussed. In reducing atmospheres, an inner refractory tube is used for platinum couples but is not considered necessary for base-metal couples. Inconel tubes may be used up to 2300°F. in dry-heat applications. B.C.R.

Recent developments in laboratory apparatus. R. H. POWELL. *Iron and Steel*, **16**, 428 (1943); abstracted in *Trans. Brit. Ceram. Soc.*, **42** [9] 92A (1943).—Items of interest are the Babcock fuel sampler, which is fully described, and a gas-analysis apparatus that can give analyses for seven constituents in about 1 min.

Sieves. ANON. *Brit. Clayworker*, **52** [617] 72 (1943); abstracted in *Trans. Brit. Ceram. Soc.*, **42** [11] 114A (1943).—Wire-cloth sieves have a large screening area and square apertures and are easily cleaned by vibration. An inclined perforated plate-type screen has the advantage that there is little jamming of particles in the holes, which are considerably larger than the size of the fraction that passes through. Screens of this type are particularly suitable for dry material, but a vibrating woven screen is preferable for damp material.

Tests on grinding aids. ANON. *Cement Lime Manuf.*, **17**, 1 (1944).—Tests were carried out by E. R. Dawley at Kansas State College on the following materials as grinding aids: Vinsol resin, cod oil, beef tallow, Nopco 1900, Nopco Plastol No. 1, kojic acid, aluminum stearate, and aluminum powder. Vinsol resin is shown to be the best grinding aid from the standpoint of reducing mill revolutions with this particular clinker. Aluminum powder actually increased the number of mill revolutions to obtain 1800 specific surface. R.W.McA.

Unit process of mixing. J. P. ASQUITH. *Ind. Chemist*, **19**, 163, 280 (1943); abstracted in *Trans. Brit. Ceram. Soc.*, **42** [11] 114A (1943).—Published data on the theory of mixing are reviewed. Contrary to popular belief, baffles do not generally promote mixing. The correct use of portable stirrers is discussed.

PATENTS

Crystal grinding device. ANTHONY SPINA. U. S. 2,372,688, April 3, 1945 (Jan. 20, 1944). 5 claims. (Cl. 51-125).

Drying apparatus for clay, peat, coke, coal, etc. J. SUMMERVILLE. Brit. 567,203, Feb. 14, 1945 (March 20, 1943).

Kilns, Furnaces, Fuels, and Combustion

Heats, free energies, and equilibrium constants of some reactions involving O_2, H_2, H_2O, C, CO, CO_2, and CH_4. DONALD D. WAGMAN, JOHN E. KILPATRICK, WILLIAM J. TAYLOR, KENNETH S. PITZER, AND FREDERICK D. ROSSINI. *Jour. Research Nat. Bur. Standards*, **34** [2] 143–61 (1945); RP 1634. Price 10¢ from Supt. of Documents, Washington, D. C. R.A.H.

High-temperature firing with gas and preheated air.

E. BLAHA. *Ceram. Ind.*, **44** [2] 54, 56 (1945).—B. describes a kiln designed to fire ware above 3000°F. It has great flexibility and will fire more economically than conventional kilns now in use. 6 figures. H.T.

Industrial gas burner. B. SCHMIDT. *Giesserei*, **31** [3/4] 25–29 (1944).—The theoretical principles of the mixing of gas and air and the production of luminous and nonluminous flames are explained, and burner constructions are described. The importance of proper dimensions for gas and air lines to keep pressure fluctuations away from the flame is emphasized. The condition of combustion is indicated as follows:

Flame	Combustion
Blue	High excess of gas
Yellow	Slight excess of gas
Reddish yellow	Correct mixture
Invisible	Excess of air

M.HA.

Petroleum coke. Formation and properties. A. G. V. BERRY AND R. EDGEWORTH-JOHNSTONE. *Ind. Eng. Chem.*, **36** [12] 1140–44 (1944).—Petroleum coke is essentially a disperse system composed of graphite-like crystallites embedded in an organic matrix. Experiments on the coking of a cracked asphalt under different time-temperature conditions show that the coking process can conveniently be regarded as taking place in four stages, corresponding to the production of pitch, semipitch, asphaltic coke, and carboid coke. The properties of these substances are described, and their bearing on the quality and commercial value of petroleum coke is indicated. Illustrated. F.G.H.

Plastic characteristics of coal. Correlation with chemical and physical properties and petrographic composition. R. E. BREWER. *Ind. Eng. Chem.*, **36** [12] 1165–68 (1944).—Correlation of technological properties with rank has proved unsatisfactory for certain bituminous coking coals; thus, the carbonizing properties of a particular coal cannot always be predicted accurately from rank alone. The exceptional coals generally have one or more distinctive differences in either chemical or petrographic composition, or both, as compared with other coals of the same rank. Earlier investigations indicated that the order and extent of fusion of whole coals and selected layer samples have a definite relation to petrographic composition. B. presents a detailed study of chemical and petrographic composition and physical properties of nineteen low-, medium-, and high-volatile A bituminous coals in relation to Gieseler maximum fluidity. These coals cover the range commonly used alone or in blends for the production of commercial coke. Factors of chemical and petrographic composition found to contribute toward increasing the fluidity of a coal above that expected from its rank are high anthraxylon and translucent attritus contents and the presence of cannel coal. For coals of similar rank, those of higher physical strength generally show a higher maximum fluidity. Factors that reduce the fluidity of a coal below that expected from its rank are high contents of oxygen, ash, opaque attritus, and fusain. Illustrated. F.G.H.

Temperature, pressure, and specific volume changes of gas mixture under dissociation and re-association conditions with combustion following the straight-line law: $P = mV + n$. W. J. WALKER. *Phil. Mag.*, **35** [249] 680–85 (1944).—A direct computation method of arriving at the temperature and pressure of combustion of a mixture of fuel and air is presented, with the factors of dissociation and re-association taken into consideration. S.Z.

SEPARATE PUBLICATION

Producer Gas Plant for Industrial Purposes. ANON. Published by Nat. Fed. Gas Coke Assocs., Brit. Hard Coke Assoc., and S. Wales Anth. & Dry Coal Comm. Price 5s. Abstracted in *Fuel Econ. Rev.*, **21**, 61–66 (1942).—The following topics are discussed: (1) gas production, (2) gas generators, (3) washcoolers and filters, (4) fans, boosters, and gas-pressure control, (5) plant-control instruments and the analysis of gas, (6) sulfur removal, (7) utilization of producer gas, and (8) typical producer gas plants. An appendix gives precautions against carbon monoxide poisoning and describes the treatment of casualties, artificial respiration by the Schäfer method, and the detection of traces of carbon monoxide. E.R.V.

PATENTS

Kiln and method of operation. EMIL BLAHA (Selas Corp. of America). U. S. 2,371,420, March 13, 1945 (July 29, 1942). 19 claims. (Cl. 25-142).—5. A continuous tunnel kiln having a kiln chamber comprising an elongated firing zone with uprising side walls and having a multiplicity of burners distributed at short intervals along the length of the zone adjacent the lower edge of each of the side walls and each adapted to discharge an upwardly directed burning jet alongside the adjacent wall, means for supplying fuel gas and combustion-supporting air to each of the burners, and means for withdrawing products of combustion from the zone at a multiplicity of points distributed along the length of the zone and adjacent the lower edges of the walls.

Geology

Australian graphite. ANON. *Chem. Trade Jour.*, **113**, 274 (1943); abstracted in *Trans. Brit. Ceram. Soc.*, **42** [11] 113A (1943).—Delivery of the first consignment of refined graphite from a deposit near Port Lincoln, S. Australia, has recently been reported. The plant will soon produce about 4 tons of refined graphite a day.

Bacillarites-leverrierite-kaolinite (pillar-shaped kaolinite from the middle-Bohemian bituminous coal basin). ALEXANDER ORLOV. *Mineralog. petrog. Mitt.*, **54**, 225–44 (1942); abstracted in *Chem. Zentr.*, **1943, I** [21] 2186.—The minerals formerly designated as *bacillarites problematicus* and leverrierite must now be considered as pure kaolinite; this mineral forms little pillars which are composed of very fine, small, flat plates and contain no admixture of other minerals. Optical properties and chemical analysis agree fully with those of kaolinite. M.HA.

Bauxite discovered in Pacific Northwest. ANON. *Pit & Quarry*, **36** [10] 59 (1944).—The Bureau of Mines has announced the finding of a deposit of bauxitic clay or low-grade bauxite in King County, Wash. Assays as high as 55% alumina have been obtained. M.R.

Brazilian bauxite and aluminum. ANON. *Chem. Trade Jour.*, **113**, 161 (1943); abstracted in *Trans. Brit. Ceram. Soc.*, **42** [11] 112A (1943).—Eighty deposits of bauxite are known in Brazil, the total reserves being about 150 million tons. See *Ceram. Abs.*, **23** [9] 157 (1944).

Bristol silica enterprise. F. I. BRISTOL. *Mining Congr. Jour.*, **30** [12] 33–35 (1944).—This silica deposit averages 99.6% SiO_2 and is located near Rogue River, Oreg. The deposit is an intrusion with a shell of replacement silica on the outside. Faulting in three directions has shattered the deposit, giving the effect of natural crushing; the quartz, however, is very solidly in place. Reserves above the quarry floor are over 3,000,000 tons. Mining is done by glory-hole methods, and 11 standard sizes are produced. Equipment at the mill consists of a jaw crusher, gyratory crusher, rolls, and screens. A crew of 7 men produces 45 tons per day. The crushers and rolls need frequent building up by electric welding rods; soft-steel screens are used that have amazingly long life. A jackhammer drill bit lasts for 2 ft. 7 figures. W.D.F.

Calculating formulas for fine-grained minerals on the basis of chemical analyses. W. P. KELLEY. *Amer. Mineralogist*, **30**, 1–26 (1945).—Data are presented showing that every element found by chemical analysis can be placed in a theoretically possible three-layer lattice even when the sample is grossly impure. Therefore the fact that a possible lattice can be calculated is not proof of the mineralogical purity of the sample. The impurities may be in the form of admixtures, intergrowths, or absorbed substances. Silica is likely to be the most abundant impurity of the fine-grained minerals. It may occur as the

crystalline or the amorphous form or as adsorbed silicate ions. Phosphate, Al, Fe, or H ions may also be adsorbed. Brucite, chlorite, pyrophyllite, hydrargillite, any mica, and possibly talc, kaolinite, and halloysite may occur as occasional layers in the crystals of montmorillonite and other fine-grained clays. The fact that the calculated negative charge on the lattice just balances the positive charge of the interlayer cations is also an arithmetical necessity of the calculation. The balance merely indicates that no errors of calculation have been made. In no sense can it be taken as evidence of the purity of the sample or of the accuracy of the analysis. So-called "end-member formulas" are not unique and have no definite meaning. W.D.F.

Chemical characteristics of soils in the vicinity of Midland, Douglas County, Kansas. F. L. WYND AND J. R. ROMIG. *Soil Sci.*, **56**, 135–42 (1943).—Twenty soils in the vicinity of Midland were studied with regard to their base-exchange capacity, total replaceable bases, base saturation, total nitrogen, ammonia, nitrate, organic matter, calcium carbonate, pH of the supernatant liquid from a 1:3 mixture of soil and water, acid-soluble phosphorus, and replaceable calcium, magnesium, and potassium. The soils were classified into four groups on the basis of their chemical characteristics. Those having a small amount of total replaceable bases (5.5 to 14.8 m.e. per 100 gm.) fall into subclasses. One subgroup is very sandy with a degree of base saturation less than 100% and a pH less than 7.0, and one subgroup is clayey with a degree of base saturation greater than 100% and a pH greater than 7.0. Soils containing a large amount of replaceable bases (17.8 to 34.9 m.e. per 100 gm.) may be classified into a noncalcareous group, the pH of which is less than 7.0 and the base saturation is less than 100%, and a calcareous group, the pH of which is greater than 7.0 and the degree of base saturation is greater than 100%. 7 references, 6 figures. E.W.R.

Chemistry of soil organic matter: I, Distribution of uronic carbon in some soil profiles. A. G. NORMAN AND W. V. BARTHOLOMEW. *Soil Sci.*, **56**, 143–50 (1943).—The distribution of apparent uronic carbon in 20 soil profiles, representative of prairie, planosol, gray-brown podzolic, and podzol soils, is given. About 10 to 15% of the organic carbon of surface soils seems to be present in uronide groupings. The proportion increases with depth, particularly in podzolized soils, in which a marked accumulation may be found in the B horizon. The evidence for the presence of uronide groups in soil is presumptive, not direct, but no other carboxyl groups are known to yield CO_2 on treatment with 12% HCl. The presence of reducing agents decreases the yield of CO_2 from soil, but not to a greater extent than that from known polyuronides in the absence of soil. The apparent resistance and consequent accumulation of uronide groupings cannot yet be accounted for. Stabilization by association with some other component is a possibility. 6 references. **II, Hypoiodite oxidation of the organic matter in some soil profiles.** A. G. NORMAN. *Ibid.*, pp. 223–33.—A substantial fraction of soil organic matter is now believed to be lignin derived. The properties of lignin, particularly with respect to solubility reactions, are such that no simple extraction procedure has yet been devised. Hypoiodite may be used as a means of studying the distribution of lignin-derived material in the soil, and a procedure for the treatment of soil organic matter with hypoiodite is described. Precautions must be taken to avoid errors due to concurrent liberation of iodine from iodide. Studies have been made of detailed profile samples from 23 profiles, representing mainly prairie, gray-brown podzolic, and podzol soils. The reactivity of the organic matter in the prairie soil decreased in the immediate subsurface samples and thereafter rose steadily with depth. The gray-brown podzolic soils exhibited in some degree an effect that was sharper in the podzols. The organic matter accumulated in the B_1 or B_2 horizon was more reactive. Treatment of a number of phenolic compounds with hypoiodite led to the conclusion that the phenolic hydroxy group of lignin-derived material in the organic matter is the probable point of attack. The limitations and use of the method are described. 5 references. E.W.R.

Condition of water in porous systems. HANS F. WINTERKORN. *Soil Sci.*, **56**, 109–15 (1943).—The phase diagram for water, as worked out by Tammann and Bridgman, has been used as a basis for analyzing the physical condition of water in soil and similar porous systems. It appears that this concept leads to a ready explanation of a number of phenomena which are of considerable practical importance with regard to the stresses and strains observed in soil-water systems. In view of the importance of compacted soils in present construction in widely differing climates, the employed concept appears to be not only of theoretical, but also of immediate practical, importance. 11 references. E.W.R.

Copper deposits of Seville and Huelva. J. M. PARDO. *Inst. Geol. Min. España Mem.*, **12**, 75–84 (1944); abstracted in *Mining Jour.* [London], **223**, 663 (1944).—Spanish copper production has fallen below the level where it is sufficient to supply present needs, so that it is essential that the country discover new deposits and work those at present inactive. A number of promising deposits are known in the provinces of Seville and Huelva, and geophysical prospecting has been started on some of them. E.R.V.

Density of soil solids and their genetic relationships. W. O. SMITH. *Soil Sci.*, **56**, 263–72 (1943).—A pycnometer method for the determination of soil densities is believed to produce highly accurate results. Insufficient removal of air is shown to be a source of error. Air is locked in soil pores by Jamin capillary forces and is not easily withdrawn. It can be adequately removed and Jamin capillary forces can be overcome by subjecting the soil, when submerged in a liquid contained in a pycnometer, alternately to vacuum and to atmospheric pressure until the air is sufficiently removed. This constitutes the principal modification presented of the ordinary pycnometer procedure for soils. Comparative studies have been made of the densities obtained in water and in several organic liquids. The differences observed appear to be considerably smaller, in general, than those obtained by some other workers. The exceptions are surface horizons containing large amounts of organic matter. A method is given for determining the density of soil organic matter and of soil minerals. The organic matter is removed by chemical treatment, and its amount is determined. The density of the residue, or soil minerals, is ascertained. From the densities of the soil minerals and the total soil solids and from the amount of organic matter removed, the density of the organic matter removed is found. The values obtained agree closely with those of lignin and cellulose. The densities of total solids, of soil minerals, and of soil organic matter have been obtained for several complete profiles. The data show some simple genetic relationships and appear to warrant further study. 11 references, 2 figures. E.W.R.

Density of soil suspensions and the use of densimeters for mechanical analysis. MARIO R. CODONI. *Soil Sci.*, **56**, 7–18 (1943).—In research on the elemental mechanical analysis of soils, after their dispersal as completely as possible, C. found that in the size range between 1 and 20μ the following relationship holds between the diameter (d) of soil particles and the percentage (P) of the particles: $P = P_1 \cdot d^m$, where P_1 and m are constants characteristic of the given soil. With this expression, the variation in density in a soil suspension with depth and time can be studied. At present there is no relation by which this variation can be expressed quantitatively. From the foregoing equation was developed the following expression for the density of a soil suspension at a depth (x) and time (t) measured from the beginning of the sedimentation: $D_{ts} = 1 + k_2 P_1 (x/t)^{m/2}$; this can be applied in a given range. The variation of density with depth for various soils at a given moment and the variation in density with depth at different times for a given soil were studied, and the corresponding curves were plotted. The results obtained were applied to a study of the value of the assumptions made in the use of densimeters for mechanical analysis and in establishing the conditions that should be met in order that these assumptions be correct. Properly used, the den-

simeter is sufficiently accurate for the mechanical analysis of soils. The conditions are given under which the hypothesis is virtually true that the density measured by the densimeter appears at the midpoint of the section corresponding to the densimeter bulb. Computation of the diameter corresponding to that measured density, on that hypothesis, is sufficiently accurate. E.W.R.

Differential thermal analysis of montmorillonite. J. B. PAGE. *Soil Sci.*, **56**, 273–83 (1943).—The purpose of this investigation was to study a fairly representative group of well-authenticated montmorillonites in an attempt not only to determine the range of variability among the members of this series but also to interpret the curves obtained. Differential thermal curves were made on samples of montmorillonite that were separated from bentonites from twelve different sources. It is suggested that the variations in the type of curves given by the different samples were caused by differences in the amount of substitution in the lattices. The characteristics of the curves might be used to indicate the nature and extent of these substitutions and thus aid in arriving at a better understanding of soil colloids. 7 references, 5 figures. E.W.R.

Discoveries of potash in eastern Utah. B. W. DYER. *Amer. Inst. Mining Met. Engrs. Tech. Pub.*, No. 1755; *Mining Tech.*, **9** [1] 6 pp. (1945).—While drilling for oil in Grand County, a rich potash deposit containing sylvite and carnallite was found. Further exploration showed five different deposits. There is considerable variation in the amount of potash found in closely neighboring wells. One well in the Seven Mile area went through a carnallite bed over 300 ft. thick. The brine and salts are remarkably free of sulfates. Traces of boron, bromine, lithium, and ammonium were found in some of the brines. 1 map. W.D.F.

Evaluation of certain Belgian raw materials. LÉON CALEMBERT. *Rev. universelle mines*, **19**, 169–74 (1943); abstracted in *Chem. Zentr.*, **1943, II** [14] 1264.—Information on the properties and deposits of plastic clays, refractory materials, kaolins, slate, and lime phosphates in Belgium, Luxemburg, and vicinity is given, and the present status of exploitation is described. M.HA.

Flotation of kaolinite for removal of quartz. HERBERT H. KELLOGG. *Amer. Inst. Mining Met. Engrs. Tech. Pub.*, No. 1753; *Mining Tech.*, **9** [1] 6 pp. (1945).—High-silica kaolinite clays formed by the weathering of argillaceous quartzite and limestone occur in central Pennsylvania. They are used as rubber filler and foundry clay and in white cements, but they are too siliceous for paper filler or ceramic ware. Flotation of the clay yields a product similar to Georgia kaolin and two by-products, a minus 325-mesh sand with 95.5% SiO_2 and a minus 3-micron clay. The clay used consisted of kaolinite and quartz, which were physically separable by blunging after the addition of NaOH. The clay was allowed to settle twice, and the suspensions were separated and not treated further. The settled material was floated in a laboratory flotation cell, using lauryl amine hydrochloride as a collector. The best results were obtained at pH 3. The pulp is slightly flocculated at this pH, so a dispersant is necessary; a lignin dispersant, No. 651, was used, and optimum collection of kaolinite resulted at 1 lb. of No. 651 per ton. Other tests on the optimum amount of collector showed 0.16 lb. per ton. Even better results can be obtained by using dispersant 653 (Na salt) in place of 651 (Ca salt). 15 references, 4 figures. W.D.F.

Fundamental properties of raw clays influencing their use. C. G. HARMAN AND C. W. PARMELEE. *Jour. Amer. Ceram. Soc.*, **28** [4] 110–18 (1945).—18 references, 15 figures.

Genesis of a claypan soil: II. C. C. NIKIFOROFF AND M. DROSDOFF. *Soil Sci.*, **56**, 43–62 (1943).—The results of analyses indicate that the development of the claypan soil in Dayton silt loam and in similar poorly drained soils depends chiefly on the formation of secondary clay in place. Illuviation of the colloidal material from the upper horizons is of little importance. Its development is also accompanied by the leaching of bases and other substances. Fundamentally, therefore, it is not an illuvial horizon (although leaching of the A_2 might be one of the principal characteristics of the development of this horizon) and may be called eluvial. The character of the transition from the A_2 to the B horizon, however, indicates that in most places the uppermost part of the claypan undergoes degradation. The claypan in this layer first breaks into small, sharp, angular fragments and then crumbles; finally the crumbs disintegrate entirely into a more or less mellow mass, and the segregation of large iron-manganese concretions takes place. The possibility of formation of the A_2 horizon through the subsequent degradation of the previously formed claypan cannot be ruled out entirely. This hypothesis would require the decomposition of a large quantity of clay minerals, however, and an intense decomposition of silt in the early stage, and the mineralogical composition of the silt in the A_2 should be fundamentally different from that of the original silt in the C. Mineralogical analysis, however, failed to show the required difference. E.W.R.

Graphite and some of its applications. L. SANDERSON. *Metallurgia*, **28**, 185 (1943); abstracted in *Trans. Brit. Ceram. Soc.*, **42** [11] 113A (1943).—A brief historical account of graphite is given. It occurs mainly in metamorphic rocks, either in veins, irregular pockets and lenticles, or disseminated in the native rocks. Characteristic rock sources are gneisses, schists, crystalline limestones, and pegmatites. The quality of graphite varies, and its different industrial uses are discussed. The method of producing artificial graphite is described.

Heavy minerals of Florida beach and dune sands. ROSWELL MILLER III. *Amer. Mineralogist*, **30**, 65–75 (1945).—The identity and proportions of heavy minerals, particularly rutile and ilmenite, were determined in a representative collection of beach and dune sands from Florida. The heavy minerals were concentrated by means of heavy solutions and separated into several fractions of varying magnetic properties with a Franz isodynamic separator; proportions were determined by means of grain counts. Sixteen minerals were identified; those present in essential amounts were enstatite, epidote, garnet, ilmenite, rutile, staurolite, and zircon, and the others were corundum, hornblende, kyanite, monazite, spinel, tourmaline, apatite, and sphene. The so-called ilmenite of these sands proves to be an essentially amorphous material with its iron in the ferric state; hence, it is chemically, but seemingly not structurally, analogous to arizonite. The size distribution of the quartz sand and heavy minerals is described in two representative occurrences. W.D.F.

Hungarian bauxite. ANON. *Chem. Trade Jour.*, **112**, 461 (1943); abstracted in *Trans. Brit. Ceram. Soc.*, **42** [9] 77A (1943).—A great increase in Hungarian production of bauxite has taken place since the war began, due partly to the discovery of additional deposits. During the current year, output is expected to reach about four million tons, over four times the prewar production. The development has been directly fostered by Germany. See "Rapid...," *Ceram. Abs.*, **23** [8] 137 (1944).

Hydration-pressure relations in clays and heaving shale H. H. POWER, B. L. TOWLE, AND J. B. PLAZA. *Oil Gas. Jour.*, **41** [27] 215 (1942); abstracted in *Trans. Brit. Ceram. Soc.*, **42** [11] 111A (1943).—The literature on the swelling of clay minerals on wetting is reviewed, and the significance of this phenomenon in boring for oil is considered. Apparatus is described for measuring this swelling pressure. Experiments indicate that montmorillonite can exert considerable pressures when confined during hydration. The swelling pressure appears to be governed to some extent by the nature of the exchangeable bases. In the early stages of hydration, the swelling process follows a relationship of the type $P = kt^n$, where P = pressure, t = time, and k and n are constants. See "Chemical. . . ," *Ceram. Abs.*, **21** [3] 68 (1942).

Indian bauxite. ANON. *Chem. Trade Jour.*, **112**, 504 (1943); abstracted in *Trans. Brit. Ceram. Soc.*, **42** [8] 67A (1943).—A large deposit of bauxite in Travancore is being exploited; the full rate of output will not be attained until the State's hydroelectric program is completed. *Chem. Trade Jour.*, **113**, 63 (1943); abstracted in *Trans.*

Brit. Ceram. Soc., **42** [10] 95A (1943).—A deposit of titaniferous bauxite has been discovered in Jashpur State, Chota Nagpur. It contains 51 to 60% Al_2O_3 and up to 14% TiO_2.

Investigations of a group of Italian clays (district of Boca, Piedmont). CELESTINO FICAI. *Ceramica* [Rome], **5**, 19–30 (1943); abstracted in *Chem. Zentr.*, **1943, II** [14] 1265.—Chemical, physical, mineralogical, and technological properties of these clays were determined. All are kaolinitic clays with a more or less high content of finely divided silica. M.HA.

Measuring grain boundaries in crystalline rocks. G. W. BAIN. *Jour. Geol.*, **49**, 199 (1941); abstracted in *Trans. Brit. Ceram. Soc.*, **42** [9] 92A (1943).—A technique for measuring grain perimeters and surfaces in crystalline rocks is outlined. The application of the results to the determination of the width of intergranular space and adsorptive capacity is indicated.

Measurements of pH with the glass electrode as affected by soil moisture. L. E. DAVIS. *Soil Sci.*, **56**, 405–22 (1943).—D. studied the operation of the glass electrode, the calomel half-cell with salt bridge, and the vacuum-tube amplifier when used to measure the pH of soils at low moisture contents. In dry soils, commercial vacuum-tube amplifiers may give erroneous results because the product of the grid current and the resistance of the soil yields an extraneous e.m.f. Difficulties may be encountered with the use of the salt bridge in dry soils. The apparent pH obtained in soils of low moisture content depends greatly on the treatment given the glass electrode before use. There is no acceptable evidence that dry soils are characteristically more acid or more alkaline than moist soils. Attempts to measure the pH of soils below the moisture equivalent are undesirable. Hydrogen-saturated soil suspensions naturally should become more acid as they become more concentrated; base-saturated soils naturally become less alkaline as a result of decrease of hydrolysis. 10 references, 2 figures. E.W.R.

Method of determining soil-moisture content based on the variation of the electrical capacitance of soil, at a low frequency, with moisture content. ALFRED B. C. ANDERSON. *Soil Sci.*, **56**, 29–42 (1943).—The electrical capacitance of moist soil of different textures and of different moisture contents was determined with an a.-c. Wheatstone bridge excited by a frequency of 1000 cycles and with a specially designed probe condenser of which the sensitivity to changes of soil-moisture content was considerably enhanced by electrode polarization. The data were obtained on five Yolo soils covering a range of textures and varying in moisture equivalent from 6.7 to 29.1. All the data indicate that the shape of the curve giving the dependence of electrical capacitance on soil-moisture content, above the permanent wilting percentage over the range of readily available moisture to plants, does not (within the present experimental error) depend appreciably on soil texture. Although a condenser of only one geometrical shape was used in reaching the foregoing conclusions, a condenser of almost any other shape should lead to similar results. In practice, the exact shape and design of the soil condenser would be determined by the purpose for which it is to be used. A method, which seems to show promise, is suggested for using the capacitance method as a soil-moisture content indicator, whereby it would seem unnecessary to calibrate the condenser over the entire range of soil-moisture content for every soil on which the method is used. A reply is made to a theoretical argument (presented elsewhere in the literature) leading to the conclusion that the capacitances of soil and of porous plaster condensers are unreliable indicators of soil-moisture content. The argument is shown to be based on experimentally unfounded assumptions and a seeming disregard of the effect of polarization in moist dielectrics and at electrode surfaces. 28 references, 3 figures. See "Four. . . ," *Ceram. Abs.*, **22** [5] 78 (1943). E.W.R.

Mining silica hydraulically. BROR NORDBERG. *Rock Products*, **47** [11] 44–47, 54–55 (1944).—Silica is conveyed through pipe lines from the deposit to the plant. Water is preheated in winter to permit operation. B.C.R.

Philippine mineral industry in the postwar period. H. FOSTER BAIN. *Mining Mag.*, **72**, 9–19 (1945).—There are several important deposits of chromite, including the natural refractories grade ore at the Masinloc mine with a reserve of 10,000,000 tons. A Portland cement industry uses local clay. Other deposits present are gold, iron, a little coal, possible petroleum, copper, and manganese. W.D.F.

Photronic method for determining potassium in soils and plants. W. H. GARMAN. *Soil Sci.*, **56**, 101–107 (1943).—Although reliable, gravimetric and volumetric methods for the quantitative determination of potassium are time-consuming. This is also true of the colorimetric methods used in the clinical laboratory. The ordinary rapid tests for potassium are not sufficiently accurate for many purposes. G. describes a method that affords a reasonable degree of accuracy, compared with a well-known gravimetric method, and at the same time is simple and rapid. The method consists in first extracting the soil sample with a sodium acetate–acetic acid solution, filtering, adding an alcoholic sodium cobaltinitrite solution, and determining the optical density in a photoelectric colorimeter. E.W.R.

Pressure-plate apparatus for measuring moisture sorption and transmission by soils. L. A. RICHARDS AND MILTON FIREMAN. *Soil Sci.*, **56**, 395–404 (1943).—An apparatus is described that is an improvement over previous apparatus in obtaining sorption data in the range 0 to 2000 cm. of water tension. It can also be used for obtaining a quantitative measure of moisture transfer rates in unsaturated soil. The cell of the apparatus uses a porous ceramic plate for measuring the relation between moisture content and moisture tension in soil samples over the soil moisture tension range 0 to 2 atm. The air-water interface curvature is controlled by air pressure. Determinations made with the pressure-plate apparatus are in agreement with those made by the suction method. Examples are given of the effect of various soil-sample treatments on moisture retention, and the use of the apparatus for studying hysteresis and moisture movement in unsaturated soil is illustrated. 9 references, 6 figures. E.W.R.

Rapid method of determining exchangeable hydrogen and total exchangeable bases of soils. IRVIN C. BROWN. *Soil Sci.*, **56**, 353–57 (1943).—The procedure entails simple pH determinations of a suitable buffer soil mixture. It is estimated that 15 to 20 determinations can be made per hour. A comparison of the results obtained by the pH method and those obtained by other methods indicates excellent practical agreement. 9 references, 2 figures. E.W.R.

Rotary sieve method for determining the size distribution of soil clods. W. S. CHEPIL AND F. BISAL. *Soil Sci.*, **56**, 95–100 (1943).—Considerable progress has been made in devising suitable methods of determining the water-stable aggregate structure of soils, but little information is available on suitable methods of ascertaining the size distribution of soil clods. Sieving the soil by hand is simple but suffers from serious drawbacks. The authors describe an apparatus which eliminates a number of the drawbacks of flat sieves. It consists essentially of a series of rotating, concentric sleeves, inclined at a slight angle and having screening mounted as annular rings in the sleeves. The oversize from any screen slides down the sleeve in which that screen is mounted into a pan, while the undersize goes through the screen into the next larger concentric sleeve and onto the next screen. Different lengths of the various sleeves permit the different portions to be discharged into separate containers. A relatively small angle of cylinder incline (4°) and a relatively slow cylinder rotation (14 r.p.m.) in the rotary sieve method of analysis allow the soil clods to roll and slide gently over the sieves, thus ensuring the least possible breakdown and the maximum effectiveness of separation. A table of the comparative results of dry sieving of soils by hand and by the rotary sieve method is given. 11 references, 2 figures. E.W.R.

Specific surface of some clay minerals, soils, and soil colloids. R. A. NELSON AND S. B. HENDRICKS. *Soil Sci.*, **56**, 285–96 (1943).—Particle size, size distribution, particle

shape, degree of dispersion, and specific surface of the silt and clay fractions are important factors influencing the physical properties of soils. The first two factors are generally determined by sedimentation methods after the soil is thoroughly dispersed in water. This dispersed condition is artificially compared with undisturbed soils and has a marked influence on clay fractions of some soils. Specific surface is determined not only by particle size and size distribution but also by particle shape and the presence of cracks and pores. Observation of the particle shape and size by the electron microscope permits approximate comparison of surface areas measured by gas adsorption and of apparent geometrical or external areas observed on electron micrographs. Absorption of nitrogen and of ethane was used to determine the specific surface areas of a number of clay minerals, soils, and soil colloids, and the average particle sizes determined in this manner are in essential agreement with values obtained from electron micrographs. Clay minerals, upon heating, lose their water of constitution without essential change of particle size. Amounts of colloids in soils can be determined from gas sorption on the soils and a portion of the separated colloids. This method is of particular value when adequate dispersion for particle analysis by sedimentation cannot be attained. Average particle sizes in colloids from surface horizons of five soils of widely different types are greater than those of the *B* and *C* horizons. This indicates removal of the finer clay mineral particles from the surface soil by chemical disintegration. 14 references, 5 figures. E.W.R.

Water table, equipotentials, and streamlines in drained land. E. C. CHILDS. *Soil Sci.*, **56,** 317–30 (1943).—The shape and location of the water table and the nature of the flow of ground water to the drains for given conditions of rainfall, soil permeability, and drainage layout are discussed. The difficulties of mathematical analysis of field-drainage problems are at present insuperable, but progress may be made by electrical analogy, since the equation of flow of ground water to parallel drain lines is also the equation of two-dimensional flow of electricity in a sheet conductor. Three sets of experiments are presented to show (*a*) how the water-table falls with increase of drain diameter or, alternatively, with reduction of drain separation; (*b*) the relation of water-table height to rate of rainfall; and (*c*) the influence of the depth of the impermeable floor below the drains. It is shown that the well-known formula giving an elliptical water-table section is not in accordance with the requirements of the potential theory. The relation of such laboratory work to practical drainage problems is briefly discussed. 11 references, 10 figures. E.W.R.

X-ray analysis of some soil colloids from Gingin, Western Australia. W. F. COLE. *Soil Sci.*, **56,** 153–71 (1943).—The composition of 13 soil colloids from 5 soil profiles in the Gingin district was determined by X-ray analysis. The composition varies little throughout any profile. Three phases of Whakea sand may now be recognized: kaolinite-goethite, kaolinite-hematite, and kaolinite. In contrast to the Gingin upper greensand, the Gingin chalk has yielded a soil profile little different in composition from the underlying bedrock. In two profiles there is a correlation between copper values of covering vegetation and the presence of hematite and goethite. Much work would be required before any significance could be attached to this. Widespread copper deficiency at Gingin may be associated with the prevalence of greensand beds, and the availability of copper may be locally modified by the character of the iron oxide. The aggregate method of analysis has been found useful in detecting small amounts of clay minerals. X-ray analysis of soil colloids has been used to check geological boundaries. 7 references, 2 figures. E.W.R.

Zunyite in Utah. T. S. LOVERING AND BRONSON STRINGHAM. *Amer. Mineralogist*, **30,** 76–77 (1945).—Zunyite has been found in the Tintic district, at the Mintintic property a mile and a half south of Silver City. It occurs as a fissure, filling and impregnating the country rock. Associated with it are rutile, alunite, dickite, octahedral pyrite, and two generations of quartz, all younger than the zunyite. Its average index of refraction is 1.595. This index correlates it with the high fluorine zunyite from Colorado. W.D.F.

SEPARATE PUBLICATIONS

Beryllium and Tungsten Deposits of the Iron Mountain District, Sierra and Socorro Counties, N. Mex. R. H. JAHNS with a section on the beryllium minerals by J. J. GLASS. *U. S. Geol. Survey Bull.*, **945-C,** 42 pp. (1944). Price $1.25 from Supt. of Documents, Washington, D. C.—Beryllium and tungsten deposits of contact-metaphoric origin occur in the Iron Mountain district, in northwestern Sierra County and southwestern Socorro County, N. Mex. Most of the beryllium is in the complex silicate mineral helvite, but some occurs as a minor constituent of grossularite, garnet, idocrase, and chlorite. The report contains estimates of reserves of the beryllium-bearing rock and of the tungsten ore. The low grade of most of the Iron Mountain tactite or iron-rich silicate rock precludes its successful competition with beryl ore as a current source of beryllium. Most of the tungsten ore is too low grade to be shipped without milling. R.A.H.

Marketing Vermiculite. G. RICHARDS GWINN. *U. S. Bur. Mines Information Circ.*, **7270,** 15 pp. (Jan., 1944). Free.—Vermiculites are described, and their geologic occurrence and origin, history, domestic and foreign deposits, preparation and exfoliation, and uses are discussed. Lists of producers and exfoliating plants are included. 20 references. M.R.

Potash Salts from Texas-New Mexico Polyhalite Deposits. JOHN E. CONLEY AND EVERETT P. PARTRIDGE. *U. S. Bur. Mines Bull.*, **459,** 251 pp., 62 figs. (1944). Price 35¢ from Supt. of Documents, Washington, D. C. R.A.H.

Chemistry and Physics

Analysis of aluminous ore by means of spark spectra. J. RAYNOR CHURCHILL AND RAYMOND G. RUSSELL. *Ind. Eng. Chem., Anal. Ed.*, **17** [1] 24–27 (1945).—A rapid economical spectrographic method for the analysis of aluminous ore has been developed, which meets the requirements of a routine method for grade sorting and preliminary testing of ores. Similar techniques have been found useful on a wide variety of metallic and nonmetallic powders. Illustrated. F.G.H.

Analysis of hardness. A. C. VIVIAN. *Phil. Mag.*, **35** [250] 765–77 (1944).—As a preliminary to the re-examination of the nature of hardness, an analysis is made of the mechanics of the various hardness tests. The discussion is limited to the Brinell test. Mathematical analysis is made of certain factors in the Brinell test. S.Z.

Analytical applications of emission spectrometry. J. RAYNOR CHURCHILL. *Ind. Eng. Chem., Anal. Ed.*, **17** [2] 66–74 (1945).—The status of emission spectrometry as an analytical technique in the general analytical laboratory is discussed with particular attention to nonroutine applications. Several techniques involving qualitative and semi-quantitative tests on a wide variety of materials are described. Specific examples, drawn from the files of the Aluminum Research Laboratories, are given to illustrate the usefulness of the spectrograph in general qualitative analysis in the identification of alloys, in seeking explanations for differences in physical and chemical properties, in the analysis of coatings and platings, in corrosion investigations, and in a variety of other special applications. The limitations, as well as the advantages, of spectrographic methods in qualitative and quantitative analysis are pointed out. Illustrated. F.G.H.

Apparatus for preparing samples for analysis. Rapid pulverizing and mixing of small solid samples. LOUIS

LYKKEN, F. A. ROGERS, AND W. L. EVERSON. *Ind. Eng. Chem., Anal. Ed.*, **17** [2] 116–18 (1945).—A sample pulverizer is described which is designed for the rapid preparation of large numbers of 3- to 20-gm. solid samples for analysis, with negligible contamination or loss of material. It is essentially a small high-speed hammer mill. A practical apparatus for mixing the pulverized samples, consisting of a weighing-bottle clamp rotated by a motor-driven shaft, is also described. Illustrated. F.G.H.

Comparative liquid-junction potentials of some pH buffer standards and the calibration of pH meters. GEORGE G. MANOV, NICHOLAS J. DELOLLIS, AND S. F. ACREE. *Jour. Research Nat. Bur. Standards*, **34** [2] 115–27 (1945); RP 1632. Price 5¢ from Supt. of Documents, Washington, D. C. R.A.H.

Determination of carbon, hydrogen, and chlorine in gaseous compounds. Application of the microtrain. E. W. BALIS, H. A. LIEBHAFSKY, AND L. B. BRONK. *Ind. Eng. Chem., Anal. Ed.*, **17** [1] 56–60 (1945).—Illustrated. F.G.H.

Determination of small amounts of zinc by measurement of fluorescent turbidities. LYNNE L. MERRITT, JR. *Ind. Eng. Chem., Anal. Ed.*, **16** [12] 758–60 (1944).—A rapid and accurate method for the determination of zinc by measuring the fluorescence of a turbidity of zinc 8-hydroxyquinolinate is described. The range of the method is from 0.05 to 0.60 mg., and the accuracy is about 0.02 mg. The influence of variations in temperature, filters, method of procedure, amount of reactants added, and extraneous salts has been investigated. Other ions precipitated by 8-hydroxyquinoline in acetic acid–acetate solutions interfere. Zinc can be determined in the presence of magnesium by the method if calibration curves are constructed using approximately the amount of magnesium present in the unknowns. Illustrated. F.G.H.

Glassforming properties. B. SCHWEIG. *Chem. Age* [London], **50** [1283] 125 (1944).—Several approaches have been made to determine whether an element or its oxide acts as a network former in glass (SiO_2, B_2O_3, etc.), as a stabilizer (CaO), or as an intermediate (Al_2O_3). The ρ value introduced by Sun and Silverman (*Jour. Amer. Ceram. Soc.*, **25** [4] 97–100 (Feb. 15, 1942)) and the use of the ionic potential by Pincus ("Glass...," *Ceram. Abs.*, **21** [10] 210 (1942)) are discussed. The criterion for the glass-forming property of an element or compound preferred by S. is the σ value: $\sigma = (vc\sqrt{ra})/(va\sqrt{rc})$, where vc = valency of the cation, rc = ionic radius of the cation, ra = ionic radius of the anion, and va = valency of the anion. The alkali oxides have a σ value from 0.44 to 0.70; the stabilizers, from 0.98 to 2.04; the intermediates, from 2.04 to 2.40; and the network formers, from about 3.14 to 5. No overlapping takes place. Ta_2O_5 and Cb_2O_5, with σ values of 3.29 and 3.42, would be classified as glassformers, a conclusion differing from that of Sun and Silverman and more in agreement with the facts. A.B.S.

Light absorption spectrometry. M. G. MELLON. *Ind. Eng. Chem., Anal. Ed.*, **17** [2] 81–88 (1945).—The analytical applications of light absorption spectrometry involve determination of the absorptive capacity of materials for radiant energy in the wave-length range of 400 to 750 mμ. These are the wave lengths that produce the sensation of light in the human eye. Since selective absorption results in color, when the unabsorbed radiant energy reaches the eye, this kind of method may be considered as a type of colorimetry. The uses of such absorptive measurements may be grouped into two general categories: Qualitative uses depend upon the kind of absorption, i.e., the nature and contour of the transmittance-wave length curve. In colorimetry this involves the hue of the system. Quantitative uses depend upon the intensity of absorption, i.e., the height of the characteristic portion of the curve. In colorimetry this involves luminance and purity, which in turn depend upon the amount of the absorbing constituent present. Illustrated. F.G.H.

Microdetermination of calcium by titration of the oxalate with ammonium hexanitratocerate. CHARLES D. KOCHAKIAN AND R. PHYLLIS FOX. *Ind. Eng. Chem., Anal. Ed.*, **16** [12] 762–64 (1944).—Ammonium hexanitratocerate in 1 *N* perchloric acid is a very good reagent for the microdetermination of calcium by direct titration of the oxalate at room temperature. The indicator Setopaline C gives an extremely sharp end point with this reagent. Certain precautions must be observed in the preparation and storage of the ammonium hexanitratocerate solution. The reagent must be dissolved and kept in 1 *N* perchloric acid to prevent the irreversible hydrolysis of the salt. It is decomposed by light in either clear or brown glass bottles. The solution generally decreases in normality more rapidly when prepared in increased concentration of perchloric acid. The solution, however, is stable in a black bottle, in which the decrease in titer is only about 2.5% over a period of 90 days. This change may be further lessened by keeping the bottle in the dark. Finally, the calcium oxalate must be dissolved in at least 1 *N*, but not concentrated, perchloric acid. F.G.H.

Microdetermination of magnesium with the polarograph. C. CARRUTHERS. *Ind. Eng. Chem., Anal. Ed.*, **15**, 412 (1943); abstracted in *Trans. Brit. Ceram. Soc.*, **42** [9] 94A (1943).—A polarographic procedure is given for the determination of microquantities of Mg as the hydroxyquinolate.

Optimum thickness of powder specimens in X-ray diffraction work. A. TAYLOR. *Phil. Mag.*, **35** [248] 632–38 (1944).—The intensity of the spectra from X-ray powder specimens is closely related to the absorption of the beam by the specimen itself. The absorption can be classified into (*a*) macroabsorption, related to the packing of the sample, and (*b*) microabsorption, related to the absorption of the individual particles. With particles of a given size, the intensity of reflection depends upon the total volume transversed by the rays or, in flat preparations, the thickness transversed by the rays. T. presents a mathematical analysis of the optimum thickness for (1) a flat powder compact for transmission spectra, (2) a flat powder plate for reflection spectra, and (3) a cylindrical powder specimen. 4 references. S.Z.

Photoelastic effect in crystals. S. BHAGAVANTAM. *Proc. Indian Acad. Sci.*, **16A**, 359 (1942); abstracted in *Trans. Brit. Ceram. Soc.*, **42** [10] 108A (1943).—A method, based on the theory of groups, for obtaining the number of optical, elastic, and stress-optical coefficients necessary for describing these properties for each of the 32 classes of crystals is given. The stress-optical coefficients are worked out in detail for each class.

Photometric estimation of potassium by a modification of the Jacobs-Hoffman method. A. EDEN. *Analyst*, **68**, 167 (1943); abstracted in *Trans. Brit. Ceram. Soc.*, **42** [10] 110A (1943).—A modified cobaltinitrite method is described. Minor improvements of the conditions of precipitation and washing are suggested; the K is determined photometrically on the basis of the Co of the precipitate by the formation of a green complex with choline hydrochloride and $K_4Fe(CN)_6$.

Rapid analysis of the crude dolomite batch. D. A. NIRENSHTEĬN AND N. P. GOLOVKO. *Zavodskaya Lab.*, **10**, 418–21 (1941); abstracted in *Chem. Zentr.*, **1943, I** [21] 2230.—A method for the rapid determination of SiO_2, CaO, Al_2O_3, MgO, Fe_2O_3, and the ignition loss of dolomitic ores with sufficient accuracy for practical purposes is described. The time for determining SiO_2 is 60 to 80 min., Fe_2O_3 30 to 40 min., Al_2O_3 60 to 80 min., CaO 35 min., and MgO 3.5 to 4 hr. M.HA.

Rapid volumetric method for aluminum. L. J. SNYDER. *Ind. Eng. Chem., Anal. Ed.*, **17** [1] 37–38 (1945).—A rapid and accurate procedure is described for the determination of aluminum in the presence of 1 to 10% of impurities such as calcium, copper, chromium, iron, magnesium, manganese, and zinc. Experimental data are presented showing the accuracy and the effects of impurities commonly associated with aluminum. Five to ten minutes is required per analysis. F.G.H.

Scattering of light in single crystals. S. BHAGAVANTAM AND J. V. NARAYANA. *Proc. Indian Acad. Sci.*, **16A**, 366 (1942); abstracted in *Trans. Brit. Ceram. Soc.*, **42** [10] 108A (1943).—Intensity and depolarization measurements of Rayleigh scattering were made in cut and polished single

crystals of calcite and quartz, with special reference to directional excitation.

Slag system: MnO–Al_2O_3–SiO_2. HELEN TOWERS AND JAN M. GWOREK. *Jour. West Scot. Iron Steel Inst.*, **51** [6] 123–32 (1943–1944).—The method and equipment for making viscosity determinations of the system MnO–Al_2O_3–SiO_2 are described in detail. All evidence points to a range of liquid immiscibility in the system near the rhodonite composition. The addition of FeO removes the immiscibility by increasing the basicity until the slag is of such composition that rhodonite is no longer the primary phase. The effect of Al_2O_3 on the composition is to cause an initial increase in viscosity with additions up to 10%, but with further increases up to 15%, viscosity is reduced to the order of that given by slags with no alumina additions. B.C.R.

Study of the reflecting power of constructional and building materials for heat rays. W. SIEBER. *Z. Tech. Physik*, **22**, 130 (1941); abstracted in *Trans. Brit. Ceram. Soc.*, **42** [9] 85A (1943).—The emissivity of a large number of building materials was determined by measuring the diffuse reflecting power of the different wave lengths, which are the complements of the emissivity for opaque substances. Among the materials tested were plaster, cork, white enamel, cement, wall and roofing tile, porcelain, polished and oxidized aluminum, etc. Materials containing water, e.g., gypsum, or upon which water was absorbed, gave the characteristic absorption spectrum of water superimposed upon that of the substance; this is illustrated by data on fused alumina having different surface moisture contents.

System magnesium oxide–boric oxide. H. M. DAVIS AND M. A. KNIGHT. *Jour. Amer. Ceram. Soc.*, **28** [4] 97–102 (1945).—10 references, 5 figures.

Tannin as a selective reagent for zirconium. W. R. SCHOELLER. *Analyst*, **69** [822] 259–62 (1944).—Zirconium is quantitatively precipitated by tannin from a chloride solution containing free HCl below 0.1 *N* concentration. The reaction affords a separation of zirconium from sesquioxides, monoxides, uranium, vanadium, and thorium; titanium and tin are precipitated with zirconium. The advantage of tannin as a selective reagent for zirconium is discussed. B.C.R.

Variations in composition and properties of the calciferous amphiboles. A. N. WINCHELL. *Amer. Mineralogist*, **30**, 27–50 (1945).—Nearly 200 common hornblende analyses have been plotted on a partial triangle with the end members $Ca_2(Mg,Fe'')_5Si_8O_{22}(OH)_2$, $Ca_2(Mg,Fe'')_3(Al,Fe''')_4Si_6O_{22}(OH)_2$, $NaCa_2(Mg,Fe'')_5AlSi_7O_{22}(OH)_2$, and $NaCa_2(Mg,Fe'')_4(Al,Fe''')_3Si_6O_{22}(OH)_2$. By expanding the partial triangle to a partial triangular prism, it is possible to plot the physical properties of these amphiboles in the prism. The end members with iron are at the top of the prism, and their Mg and Al analogs are at the base. This figure is shown. Since several less important variables are disregarded in developing this diagram, it must be considered only as an approximation. In a similar way, the composition and physical properties of certain oxyhornblendes are shown in another figure. W.D.F.

Volumetric determination of calcium in presence of silica, iron, aluminum, magnesium, phosphorus, titanium, and manganese. JAMES J. LINGANE. *Ind. Eng. Chem., Anal. Ed.*, **17** [1] 39–41 (1945).—A volumetric oxalate-permanganate procedure is described, which permits the direct determination of calcium in the presence of amounts of silica, iron, aluminum, magnesium, and phosphate that are equal to or somewhat greater than the amount of calcium and also in the presence of small amounts of titanium and manganese. The procedure employs only a single precipitation of calcium oxalate from acidic medium. Duplicate determinations can be completed within two hours, and the accuracy compares favorably with the more laborious classical methods which require the prior removal of most of the above elements. F.G.H.

X-ray diffraction examination of gamma alumina. M. H. JELLINEK AND I. FANKUCHEN. *Ind. Eng. Chem.*, **37** [2] 158–63 (1945).—Controlled heating experiments were made on γ-alumina, and the products were studied by both wide-angle and low-angle X-ray scattering methods. New lines in the side-angle diagrams suggest a different unit cell from the accepted one. Both methods are used to evaluate crystallite and particle size. Illustrated. F.G.H.

General

Aims and scope of engineering curricula—a round table: Introduction. H. J. GILKEY. *Jour. Eng. Education*, **31** [4] 322–26 (1940). **Social-humanistic aspects of the curriculum.** R. E. DOHERTY. *Ibid.*, pp. 326–32. **Detailed critical analysis of the report.** FRANKLIN THOMAS. *Ibid.*, pp. 332–35. **Technical aspects of the curriculum.** H. E. WESSMAN. *Ibid.*, pp. 335–38. **Integrated vs. stratified curriculum.** E. L. MORELAND. *Ibid.*, pp. 338–41. **Are recommendations in the report compatible with a four-year curriculum?** IVAN C. CRAWFORD. *Ibid.*, pp. 342–43. **Plea for a liberal four-year engineering curriculum.** P. T. NORTON. *Ibid.*, pp. 343–45. **Questions and answers.** *Ibid.*, pp. 345–57. E.W.R.

Avoiding high stoker maintenance. A. R. MUMFORD. Presented at joint A.S.M.E.-A.I.M.E. Fuels Meeting, St. Louis, Sept.-Oct., 1942; abstracted in *Combustion*, **14** [4] 43–47 (1942). H.E.S.

Ceramic development shows trend toward better product. ANON. *Ceram. Ind.*, **44** [2] 44–49 (1945).—A general picture is given of new processes and their resulting products in the field of whiteware, glass, and enamels. 27 illustrations. H.T.

Ceramic materials. ANON. *Ceram. Ind.*, **44** [1] 69–142 (1945).—Ceramic materials used in the manufacture of all types of enamel, glass, and pottery products are listed alphabetically, with details of their properties and their functions in the various ceramic bodies. This directory has become a yearly feature of *Ceramic Industry* and represents a valuable practical aid to the ceramist in the development of new products. The 1945 issue is practically identical with the one published a year ago. H.T.

Dust diseases on the increase. H. MABSON. *Can. Machinery*, **54** [6] 114–15 (1943).—The seriousness of this menace is discussed. M.A.S.

Henry Charles Kleymeyer. ANON. *Bull. Amer. Ceram. Soc.*, **24** [4] 119–21 (1945).—1 photo.

Molding-sand testing and economy. E. DIEPSCHLAG. *Giesserei*, **31** [5/7] 37–43 (1944).—Methods for testing molding sands (especially according to German testing standards) are discussed, their deficiencies in determining the correct qualities are explained, and improved methods are suggested. A formula is developed for calculating the average temperature to which the sand is heated while the form is filled; sufficient time must be allowed for cooling the sand before re-using it as moist sand. Another formula gives the amount of new sand to be added daily for a given production. M.HA.

Postwar construction project plans: a progress report. THOMAS S. HOLDEN. *Bull. Amer. Ceram. Soc.*, **24** [4] 144–47 (1945).

Postwar employment. F. D. NEWBURY. *Bull. Amer. Ceram. Soc.*, **24** [4] 142–44 (1945).

President's address. EDWIN H. FRITZ. *Bull. Amer. Ceram. Soc.*, **24** [4] 139–42 (1945).—1 photo.

Regeneration of sand. L.-F. GIRARDET. *Bull. assoc. tech. Fonderie*, **16**, 27–30 (1942); abstracted in *Chem. Zentr.*, **1944, I** [11/12] 687.—Sands are regenerated by an addition of clay; this method is the more effective, the lower the dust content of the sand. Dust also influences the restoration of the gas permeability of the sand and should therefore be kept as low as possible. The dry dedusting method is more efficient than the wet dedusting

method. The clay is added first dry, and only after the mixture has been completely homogenized is water added and the mixing process finished. It is advisable to use rain water, as salt-containing water (especially Ca and Mg salts) causes agglomeration and coagulation with subsequent hardening of the sand. M.HA.

Relation of vision testing to safety in industry. J. LOPRESTI. *Sight-Saving Rev.*, Summer, 1944; abstracted in *Optician*, **108** [2806] 374 (1945). A.P.

Scanning the future of ceramic raw materials and new processes. ANON. *Ceram. Ind.*, **44** [1] 66–68 (1945).—Future developments in glass, whiteware, and enamels are predicted. These are based on processes which may now be in the laboratory stage but are already far enough advanced to appear in postwar production. H.T.

Trade associations in 1945. ANON. *Glass*, **22** [1] 15, 18 (1945).—The role of trade associations in the postwar period in England is discussed in view of a possible enactment of a government bill on cartels, antisocial monopolies, etc. B.C.R.

Use of cupola-furnace slag for core sand. A. FISCHER. *Giesserei*, **31** [1] 5–7 (1944).—The great amounts of cupola-furnace slags, which at present uselessly accumulate (about 8% of the furnace charge), have led to successful tests in the use of granulated and fine-ground slag as core sand. The ground slag was mixed with core oil and formed into cores.

COMPARISON OF ANALYSES

	Slag sand (%)	Silver sand (%)	Rhine sand (%)
SiO_2	50.16	98.42	96.20
Al_2O_3	9.91	0.20	1.02
FeO	4.83	Trace	0.89
MnO	2.24	0.04	0.08
CaO	30.81	0.07	0.15
S	0.19	0.006	0.009

Physical properties were determined on (1) slag sand, (2) silver sand, (3) Rhine sand, (4) Nos. 1, 2, and 3 in the ratio 1:1:1, (5) Nos. 1 and 2 in the ratio 1:1, and (6) Nos. 1 and 3 in the ratio 1:1.

Type of Test	1	2	3	4	5	6
Gas permeability	>100	93–100	>100	81	93–100	100
Shearing strength (gm./cm.²)	5300	5500–6500	5700	6000	6000	5000
Resistance of trial core at 1000°C.	Still coherent	Fell apart	Fell partly apart	Fell partly apart	Fell partly apart	Fell partly apart

Samples of 1 and 3 showed the best permeability. Although the shearing strength of slag sand is the lowest, its heat resistance is the highest. Silver sand has small round grains. Rhine sand has varying grain shape, and slag sand has practically only angular, uniform sand grains, which accounts for its good gas permeability. Experiments over two years have proved that cores up to the largest dimensions can be made of slag sand. A granulation plant is described. The cost for slag sand is very low, and the problem of finding the necessary space for the dumps is solved simply and economically. M.HA.

SEPARATE PUBLICATIONS

Filter-Paper Method for Obtaining Dust-Concentration Results Comparable to Impinger Results. CARLTON E. BROWN. *U. S. Bur. Mines Rept. Investigations*, **3788**, 20 pp. (1944). Free.—A new filter-paper method for obtaining samples of air for dust analysis in health surveys is described. The device recovers dust from the air by drawing the atmosphere through a filter paper instead of through liquid as in the impinger method long used for obtaining samples for scientific study. R.A.H.

Industrial Dust Explosions. HYLTON R. BROWN. *U. S. Bur. Mines Information Circ.*, **7309**, 7 pp. (1945). Free.—Laboratory tests indicate that many dusts now produced in the course of various manufacturing operations can form explosive mixtures in air. More than 130 carbonaceous dusts, 50 metal dusts, and 50 resins and powders used in the plastics industry have been tested and classified according to explosibility. Although explosive qualities of these substances differ, fundamental principles for preventing explosions are the same—to prevent the formation of dust clouds and to eliminate all sources of ignition. R.A.H.

PATENTS

Preparing reinforced ceramic material. J. R. PARSONS (United States Gypsum Co.). U. S. 2,371,353, March 13, 1945 (May 25, 1942); reissue of original U. S. 2,307,332 (*Ceram. Abs.*, **22** [3] 52 (1943)). 8 claims. (Cl. 25-156).—1. A continuous process for the production of a relatively thin, reinforced ceramic building slab which comprises depositing an intimate mixture of ceramic particles and a thermostable, fusible, inorganic bonding material in a layer onto a moving surface.

Silicate-coated article and method of making. H. M. MARC AND H. W. GREIDER (Philip Carey Mfg. Co.). U. S. 2,372,285, March 27, 1945 (Sept. 25, 1941). 15 claims. (Cl. 117–70).—1. A rigid article surface coated with a hardened inorganic coating which is composite in character and which comprises a base layer and a superficial layer, the base layer being the product of drying and heat curing an aqueous composition, that contains soluble silicate of which at least about 50% is potassium silicate and that contains at least about 5% of kaolinitic-type clay (by dry weight of solids in the base layer), to insolubilize the soluble silicate and harden the base layer to a solubility index not greater than 20, the insolubilized soluble silicate being at least about 30% by weight of the base layer; and the superficial layer being the product of drying and heat curing at a temperature of about 300° to 600°F. an aqueous composition applied to the heat-cured base layer and consisting of soluble silicate, of which at least about 75% is potassium silicate, to insolubilize the soluble silicate and harden the superficial layer to a solubility index not greater than 35.

Foreign Publications

With the end of the European war many publications from continental countries will again become available. Some of these will contain material that should be reported in *Ceramic Abstracts*. If you are in a position to act as an abstracter for any of these publications, will you please communicate with us.

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2525 North High Street
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THE BULLETIN SECTION

Volume 24 **May 15, 1945** **Number 5**

JOHN SPOTTS McDOWELL

JOHN SPOTTS McDOWELL

Early Life in Virginia

John Spotts McDowell was born in Tazewell County, Virginia, October 12, 1884. His father was of pure Highland Scotch descent. His mother, who is still living and in good health at the age of eighty-nine, is of English descent on her father's side and French (Alsatian) on her mother's side. All or nearly all of his ancestors came to this country between 1780 or earlier and 1800. His father's people settled in North Carolina and his mother's people, Vassar by name, settled at or near Poughkeepsie, New York.

All of J. Spotts McDowell's grade-school and most of his high-school education was obtained in the public schools at Salem, Virginia. When he was fifteen years old, his parents moved to Clearfield County, Pennsylvania. During his first year in Pennsylvania, he worked at Clearfield as a printer's devil in the printing office of Matt Savage, who published a weekly newspaper known as the *Public Spirit*. His pay was $3 a week for about sixty hours of work. According to the standards of that time, he says he was neither overworked nor underpaid, because hours were long and wages were low for practically everyone. He learned to set type, run the presses, and do various other odd jobs necessary in a printing office. After a year of this work, he returned to school and was graduated from Clearfield High School in June, 1902, four months before his eighteenth birthday. From that time until November 10, 1902, he worked as a clerk in a stationery store in Clearfield, owned by Charles T. Kurtz. He then entered the employ of the Harbison-Walker Refractories Company and has been in their employ from that time until the present.

Early Association with Harbison-Walker

His first job with Harbison-Walker was that of helper to Robert Vincent, Surveyor, at a salary of $25 a month. Later, he was put in charge of a surveying party, and after a few years of surveying, mapping, and civil and mining engineering assignments, he became assistant to L. C. Morganroth, then Chief Engineer, who was also in charge of all the Company's mineral and other properties, with headquarters in Pittsburgh. Under his tutelage, Spotts supervised some prospecting and made examinations of prospects and deposits of refractory raw materials—first fire clay and quartzite and later magnesite, chrome, and minor minerals. When not otherwise engaged during the years 1908 to 1912, he frequently worked at the laboratory making physical tests of refractory products.

While serving as Mr. Morganroth's assistant, he became more and more conscious of his need for further education. In August, 1912, he obtained a leave of absence for a sufficient period to take a college course in engineering, and during the next few years studied during the school terms and continued with his work for Harbison-Walker during the summer months. In September, 1912, he was accepted as a student at the Massachusetts Institute of Technology, Boston, Massachusetts, and decided to take the course in mining geology, primarily because it gave a broad technical foundation without too much specialization. It gave well-balanced training in theoretical chemistry, metallurgy, ore dressing, petrography, and, of course, the fundamentals of mining engineering and general and field geology. While at M.I.T., Spotts had the good fortune to win the friendship of various faculty members who were outstanding in their professions—such men as Professor Robert H. Richards, who has been called "The Father of Ore Dressing"; Charles E. Locke and Carle R. Hayward; the late Heinrich Hofman, whose book on general metallurgy has been described as "the work of an intellectual giant"; the late Joseph Lipka, a brilliant mathematician; C. L. Norton, deceased, of the Department of Physics, whose work on the drop machine for the manufacture of silica brick is well known throughout the refractories industry; and C. H. Warren, who is now Dean of Yale Sheffield Scientific School.

In the fall of 1915, it became necessary for Spotts to begin work on a graduation thesis and Kenneth Seaver, of the Harbison-Walker Refractories Company, suggested that he make a study of silica refractories. Although silica refractories of excellent quality were then being manufactured and used extensively, the industry had of necessity been developing largely on a trial-and-error basis. A scientific foundation for investigation had just been provided, however, by the classical research of C. N. Fenner on "Stability Relations of the Silica Minerals." Moreover, H. Le Chatelier in France and K. Endell and R. Rieke in Germany were at the same time making their brilliant contributions to the technology of silica and the silica refractories. During his final half-year at M.I.T., every available moment was spent either in the petrographic laboratory, studying powders and thin sections of quartzite and of fired silica refractory products, or in the library, studying every available published paper having any bearing on the subject. Most of these papers were in German. By February, 1916, the thesis and all other requirements for graduation had been completed, and Spotts returned to Pittsburgh and to his job with Harbison-Walker. The thesis was presented at the February, 1917, meeting of the American Institute of Mining and Metallurgical Engineers under the title, "A Study of the Silica Refractories" and was later published in their *Transactions* (**57**, 3–61 (1917)).

Transferred to Sales Department

In 1916, Spotts was transferred from the Mining Department to the Technical Division of the Sales Department under Kenneth Seaver, then General Sales Manager. The work at first consisted largely of the study of technical problems in connection with the use of refractory materials, largely at the plants of consumers. This led to studies of plant problems in connection with the manufacture of refractories in their own plants, to the study of test methods, and to work on research problems. He never got completely away, however, from prospecting and examination of mineral deposits for the Company's Mining Department and since 1916 has spent probably a fourth of his time on work of this nature.

Since 1916, he has made many examinations of chrome

and magnesite deposits. Before World War I, practically all of the magnesite used in the United States for refractories was imported from an area in Europe which was then a part of Austria-Hungary. With the outbreak of the war, shipments soon ceased, and it became necessary to develop other sources of supply. A considerable number of relatively small deposits of so-called "amorphous" magnesite were known to exist in California. Many of these were soon brought into production. Although a large number have been worked out and abandoned, those remaining have formed the basis for a permanent but not large magnesite industry in California.

In the early part of 1916, deposits of crystalline magnesite, which later proved to be of great size, were discovered near Chewelah, Washington. Shipments of crude magnesite began in a small way in 1916, and later a plant for the production of dead-burned magnesite was built at Chewelah by the Northwest Magnesite Company. For many years, this plant has been the largest producer of refractory magnesite in the United States.

Domestic chrome deposits likewise had to be developed during World War I, but the deposits were small and production practically ceased at the close of the war.

Sent to Pacific Coast

In December, 1916, Spotts was sent to the Pacific coast to visit all known deposits of magnesite and chrome, to establish contacts with the owners and producers, and to arrange for purchases. This work kept him on the west coast much of the time until the end of 1920. At the time of his first visit to Chewelah, only a few carloads of crude magnesite had been shipped and the extent of the deposits was not realized. Since then, several million tons have been mined, treated, and shipped, and the remaining reserves are sufficient to keep the plant in operation for many years to come.

In 1928, he was appointed Director of Research. This position he held until 1932, when a long-drawn-out illness made it impossible for him to work for about two and one-half years. Since 1934, he has worked on special assignments of problems which do not fit well into the established routine of the various Company departments. Some of the problems are connected with raw-material supplies; others are related to new developments of various kinds. He still reports to Kenneth Seaver, who is now Vice-President in Charge of Research.

With the outbreak of World War II, the chrome ore supply was again threatened. Some deposits in Cuba, however, had already been developed, and others were brought into production soon after the war started. Much of the ore was of excellent quality for use as a refractory material. Repeated trips to the mining operations were necessary during the years 1940 to 1943, and Spotts has therefore had the opportunity of seeing much of the island of Cuba and the city of Havana.

Active in Refractories Division

For some years, he was active in the Refractories Division of The American Ceramic Society, on Committee C-8 of the American Society for Testing Materials, and on the Technical Advisory Committee of the American Refractories Institute. He is a charter member of the Fellows of The American Ceramic Society.

At various times during the years 1916 to 1932, he served in the following capacities:

(1) Chairman, Pittsburgh Section, American Ceramic Society (1 year).

(2) Chairman, Program Committee, Refractories Division, American Ceramic Society (1 year).

(3) Chairman, Refractories Division, American Ceramic Society (1 year).

(4) Chairman of a Subcommittee of Committee C-8 on Refractories, American Society for Testing Materials.

(5) Chairman, Technical Advisory Committee, American Refractories Institute (several years).

Publications

Spotts' first paper to be published, "A Study of the Silica Refractories," was mentioned previously. Among other papers published are the following:

(1) (With Raymond M. Howe) "Magnesite Refractories," *Jour. Amer. Ceram. Soc.*, **3** [3] 185–246 (1920).

(2) (With H. S. Robertson) "Chrome Refractories," *ibid.*, **5** [12] 865–87 (1922).

(3) "Refractories in the Steel Industry," *Blast Furnace & Steel Plant*, **11** [10] 525; [11] 569 (1923).

(4) "Mineralogy of Clay, I," *Jour. Amer. Ceram. Soc.*, **9** [1] 55–60 (1926); "Rational Analysis of Clay, II," *ibid.*, pp. 61–65.

(5) "A General View of the Testing of Refractories," *Amer. Refrac. Inst. Tech. Bull.*, No. 28, 8 pp. (1928).

(6) "Progress in the Refractories Industry," *Blast Furnace & Steel Plant*, **17** [1] 88–90 (1929).

(7) (With S. M. Phelps) "Present Status of Tests for Refractories," *Fuels and Steam Power* (*Trans. Amer. Soc. Mech. Engrs.*), **51** [22] 395–98 (1929).

(8) (With E. B. Guenther) "Refractories"; chapter 12 in Handbook of Engineering Fundamentals (O. W. Eshbach, editor). John Wiley & Sons, Inc., New York, 1936.

(9) (With L. L. Gill) "Refractory Furnace Arches, I–II," *Steel*, **102** [17] 42–48; [20] 48–50, 55–56 (1938).

(10) (With W. F. Rochow) "Choosing Refractories for the Superstructure and Regenerators of Modern Glass Tanks, I–II," *Amer. Glass Rev.*, **57** [38] 9–12; [39] 9–12; [40] 9–12 (1938).

(11) "Modern Refractories in the Steel Plant," *Blast Furnace & Steel Plant*, **26** [1] 72–74 (1938).

(12) "Sprung Arch Roofs for High-Temperature Furnaces," *Heat Treating & Forging*, **25** [7] 354; [9] 465 (1939); **26** [2] 91 (1940).

(13) "Refractories in Nonferrous Metallurgical Furnaces," *Mining Congr. Jour.*, **25** [5] 17–20 (1939).

(14) "Plant Investigation of Variables Affecting Color of Silica Brick," *Jour. Amer. Ceram. Soc.*, **26** [11] 364–67 (1943).

(15) (With W. F. Rochow, E. B. Guenther, and the entire technical staff of the Harbison-Walker Refractories Company) Modern Refractory Practice, 1st ed. 1929, 2d ed. 1937; a combined handbook and catalogue published by the Harbison-Walker Refractories Company.

A number of the above contributions to the literature have been used as textbooks in ceramic courses at various universities and colleges.

DISPERSING CLAYS IN A COLLOID MILL*

By R. Burdick

Abstract

A shale, a stoneware clay, and a ball clay were ground in a colloid mill, and the effects of the grinding on particle size, pH, and drying and firing properties were determined.

I. Introduction

Colloid mills are used extensively for emulsions chiefly in nonceramic types of products. In ceramics, the colloid mill has been used for treating clay for graphite pencil leads but apparently has not been used extensively in clay dispersion for other uses. To be economically practical, dispersion of clays with a colloid mill would have to produce desirable properties in a clay that were not obtainable by cheaper methods. When small amounts of clay are used to accomplish important functions, colloid treatment might be beneficial. For example, clays used as binders, as suspending agents, or as terra sigillata coatings might benefit by colloid-mill dispersion.

II. Experimental

To determine the effects of colloid milling on clay properties, three clays, Alfred shale, Jordan stoneware, and Kentucky ball clay No. 4 were dry-ground to pass a 20-mesh sieve. They were then prepared as thin slips by blunging for two hours with distilled water. Each slip was divided into two portions which were placed in glass carboys stoppered and sealed with paraffin. One portion of each slip was stored and the other portion was shipped to a company specializing in colloid-mill manufacture, where it was treated by running it through a $6^1/_2$-h.p. machine equipped with burrstone disks set for a 0.001-inch gap. Each slip was run at the rate of 30 gallons per hour.

The untreated and treated samples were tested simultaneously for pH, settling rate, screen fineness, and fineness as determined by the Andreasen pipette. The slips were also dewatered by drying to the plastic state and the clays were tested for dry and fired modulus of rupture and linear shrinkage and for fired absorption.

The pH was determined with a Beckman pH meter.

For rate of settle, graduated settling tubes were used, and the clear liquid percentage of the total height in the tube was plotted against time.

The method for the Andreasen pipette was that used by Loomis.[1] Drying and firing properties were determined by the conventional methods.

III. Results and Discussion

(1) pH

The pH measurements of the samples are shown in Table I. In all cases, the pH seems to have been increased slightly by the treatment received in the colloid mill. Some other factor in the handling, during their absence from the Research Department, may be responsible for the increase, but it is believed that the colloid-mill dispersion is responsible.

Table I

	pH	
	Untreated	Treated
Alfred shale	7.22	7.48
Jordan stoneware clay	4.61	4.89
Ky. ball clay	5.21	5.98

(2) Settling Rate

The curves for settling of the various samples are given in Fig. 1. From these, it is evident that the colloid milling has made the effective particle size in the clays much smaller. This effect is especially great with Jordan stoneware clay and is least with the Kentucky ball clay.

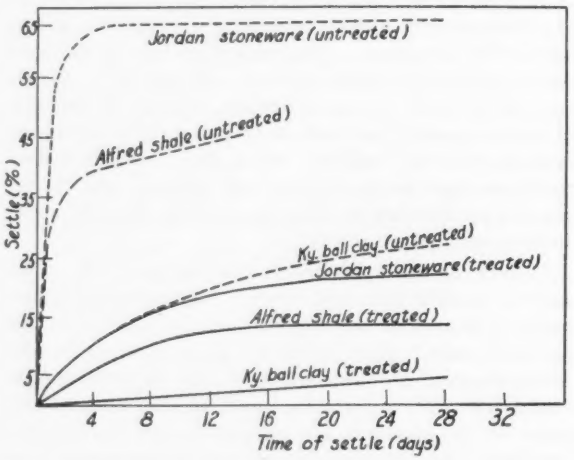

Fig. 1.—Effect of treatment in colloid mill on rate of settle.

(3) Screen Analysis

The screen analysis, as shown in Table II, shows marked differences in particle size of the clays as would be expected with the grinding disks set at a 0.001-inch gap.

(4) Andreasen Pipette

Figure 2 shows curves for the fineness as determined by the Andreasen pipette. This method shows a marked decrease in particle size for the treated Alfred shale which would be expected from the actual grinding necessary to bring 20-mesh shale particles through a 0.001-inch gap. The Kentucky ball clay shows only slight increase in fineness owing to treatment. The stoneware clay shows a small increase in the very fine sizes but an apparent

* Presented at the Forty-Sixth Annual Meeting, The American Ceramic Society, Inc., Pittsburgh, Pa., April 5, 1944 (Materials and Equipment Division.) Received November 21, 1944.

[1] G. A. Loomis, "Grain Size of Whiteware Clays as Determined by the Andreasen Pipette," *Jour. Amer. Ceram. Soc.*, **21** [11] 393–99 (1938).

TABLE II

EFFECTS OF TREATMENT OF CLAYS IN A COLLOID MILL ON PARTICLE SIZE

	Alfred shale		Jordan stoneware clay		Ky. ball clay No. 4	
	Through mill (%)	Not through mill (%)	Through mill (%)	Not through mill (%)	Through mill (%)	Not through mill (%)
On 20	0	0	0	0	0	0
On 42	0	06	0	0.03	0	0.28
On 65	0	1.69	0	0.22	0	0.57
On 80	0	0.24	0	0.11	0	0.56
On 100	0	0.81	0	0.22	0	0.80
On 150	0	2.26	0	0.42	0	1.30
On 200	0	1.92	0.02	0.64	0	1.29
On 250	0	0.71	0.02	0.20	0	0.65
On 325	0.07	2.91	0.35	1.61	0	0.27
Through 325	99.93	89.40	99.61	96.55	100.0	94.28

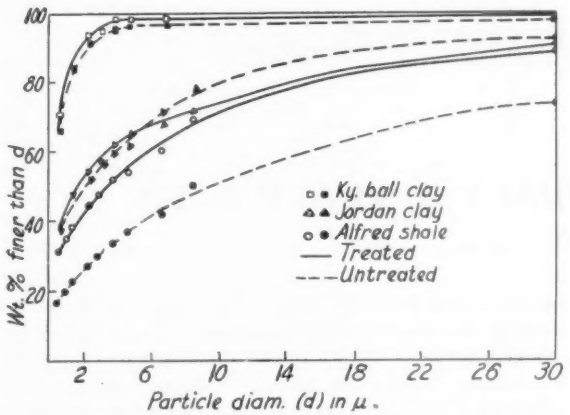

FIG. 2.—Particle size as determined by the Andreasen pipette.

decrease in fineness among the coarser fractions as a result of treatment.

The differences in fineness as determined for the ball clay and stoneware clay seem inadequate to explain the differences in rate of settle. It should be pointed out, however, that the use of the Andreasen pipette involves the addition of a deflocculant. The ball clay and the stoneware clays are both of acid character (see Table I) and would therefore tend to be flocculated into aggregates coarser than the ultimate particle size. Treatment in the colloid mill effectively disperses these aggregates as shown by the rate of settle. Dispersion, however, by the use of a deflocculant also breaks up such aggregates. The real change in ultimate particle size is relatively small. The anomalous results for the Jordan stoneware clay can probably be accounted for by the fact that this clay contains a little coarse sand. This is ground finer by the colloid milling and tends to increase the percentage of particles in the neighborhood of 25 microns without increasing the percentage of very fine particles to any great extent.

(5) Drying Properties

The linear drying shrinkage and the dry modulus of rupture of each clay are given in Table III. The percentage water is the amount present in the plastic clay when samples were formed.

The changes in shrinkage were not great, but the colloid milling caused a small decrease in shrinkage for the shale,

TABLE III

DRY STRENGTH AND DRYING SHRINKAGE OF COLLOID-MILLED CLAYS

	Water (%)	Linear dry shrinkage (%)		Dry modulus of rupture (lb./sq. in.)	
		Untreated	Treated	Untreated	Treated
Alfred shale	26	5.4	4.6	200	400
Jordan stoneware clay	41	7.9	7.9	360	410
Ky. ball clay	32	6.4	6.7	625	825

a slight increase for the ball clay, and no change for the stoneware clay. Dry modulus of rupture was markedly increased in all cases by colloid milling.

(6) Fired Properties

Figure 3 shows the fired properties of the shale and the stoneware clay at cones 010, 06, 01, and 5. The straight Kentucky ball clay did not produce usable specimens due to warpage and cracking in firing. The treated Alfred

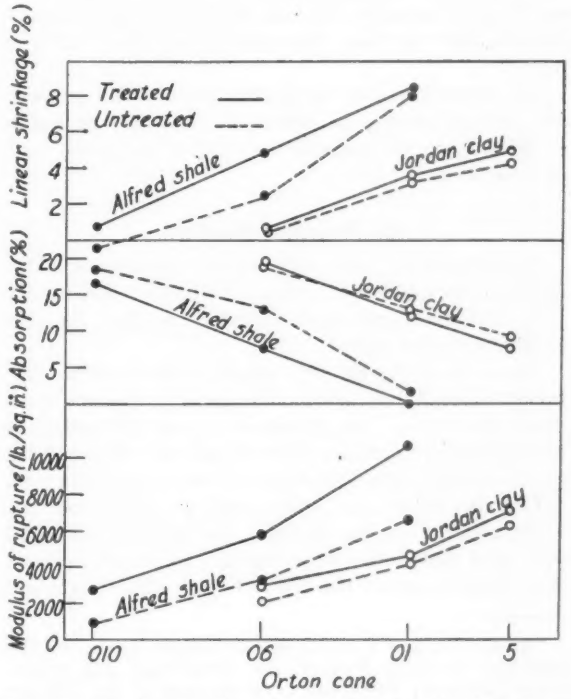

FIG. 3.—Fired properties of treated and untreated clays.

shale showed marked increases in fired strength and firing shrinkage with corresponding decreases in absorption. The change in fired properties of the stoneware clay was small but showed similar trends except in the case of the cone 06 absorption, which shows abnormally high absorption probably due to the ground sand present.

Most of the benefits obtained by colloid milling might be obtained by a combination of deflocculation and ball milling. Only when deflocculation is not permissible does it seem desirable to use the colloid mill. In this respect, the writer would recommend trying colloid-milled clay for suspending vitreous enamel slips which are commonly used in a flocculated condition.

IV. Summary

(1) The use of the colloid mill for dispersing clay slips results in greater effective fineness of the clays.

(2) Grinding of coarse shale and sand particles is accomplished, but the ultimate particle size of the very fine fractions is not greatly changed by the colloid mill.

(3) Dry and fired strengths can be improved by colloid milling.

(4) Drying shrinkage is changed to no great extent, firing shrinkage tends to be increased, and fired absorption tends to be lowered by colloid milling.

(5) Colloid milling should be most advantageous when dispersion of a clay in a medium of low pH is desired.

Acknowledgment

The author wishes to acknowledge the aid and suggestions of M. E. Holmes, Dean of the New York State College of Ceramics; of C. R. Amberg, Head of the Research Department; and of J. F. McMahon, Professor of Research.

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THE INFRARED PRINCIPLE: WHAT IT IS, WHAT IT DOES*

By William H. Tesmer

I. Introduction

The infrared-principle gas burner must not be confused with other gas burners. It generates and utilizes infrared rays to accomplish its results.

It produces an abundance (approximately 99%) of infrared rays with the result that its radiation reaches its destination with virtually no loss. All of the heat energy sent out by the burner is present at the finish to do an efficient job of heating, which means that (1) the desired results are obtained in one-half the time, (2) production is doubled, and (3) fuel consumption is reduced 25% or more.

This modern method of heating also provides a powerful, positive source, the effects of which are accurately predictable and the operation of which is simple and readily controlled.

II. Process of Radiation

The infrared gas burner is a radiant-type burner. Radiation is the simplest mode of heat transfer. Heat radiation travels through space with the incredible speed of 186,000 miles per second.

The first clue to the real nature of radiation was obtained by Sir Isaac Newton, the great genius who elucidated gravitation. He permitted a beam of sunlight to pass through a triangular prism of glass and observed that the transmitted light formed a rainbow, or spectrum, with the familiar colors, red, orange, yellow, green, blue, and violet, merging one into another. He rightfully concluded that all of these colors were originally present in sunlight, that what impressed the eye as being "white" light was merely a mixture of all colors. The length of the waves distinguishes one color from another. The red light has the greatest wave length, violet the smallest; the other colors have intermediate values. It requires about 33,000 waves of red light or 63,000 waves of violet light to extend a distance of one inch.

The human eye can respond only to this range of waves, but the so-called visible spectrum encompasses only a small part of all known radiations. Beyond the extreme red end of the visible spectrum other radiations can be detected, in this case by thermometers. These are called infrared radiations.

The radiation from a hot object is rich in the longer rays, whose wave lengths range to $^1/_{50}$ inch. Still longer waves are known, but they must be generated and detected by electrical apparatus, such as radio waves. Down the other side of the spectrum, beyond the violet region, are the X rays, gamma rays, etc. The stream of radiant energy from a material body at a given temperature consists of waves of all possible lengths but mixed in a definite proportion. The infrared gas burner is essentially a thermal radiator, which more closely approximates the standard of an ideal radiator than any other known type of burner. The temperature of the burner is maintained by the combustion of an air-gas mixture on the radiating surface itself. At its usual operating temperature of 2300°F., it acts very similar to an ideal black-body radiator. About 99% of its total radiation is in the form of efficient infrared rays. It is largely this infrared radiation which is so readily absorbed by the material to which the heat is applied; at the same time, virtually no energy is dissipated in traveling from the burner to the product.

The energy is really heat (molecular motion) only at the place where it originates and where it is received or absorbed. In between, it is radiation, a stream of energy, which goes on without loss, without hindrance. An ex-

* Listed on the Forty-Seventh Annual Program, The American Ceramic Society, Inc. (Materials and Equipment Division); presented at a meeting of the Chicago Local Section, April 7, 1945. Received January 23, 1945.

cellent example is the setting sun with its glowing red light caused by the scattering of the short waves (the blues and greens) by the earth's atmosphere; only the orange and red waves carry through. The effect is most prominent when the sun is low in the sky, as the light must pass through a much greater thickness of air and undergo a far more severe filtration of the shorter waves than when the sun is high in the heavens.

III. Applications and Advantages of Infrared Heating

The revolutionary benefits of infrared heating have been thoroughly proved in such applications as drying, melting, vaporizing, preheating, carburizing, singeing, annealing, charring, roasting, baking, and innumerable other widely differing methods of production.

When employed with a recirculating system, infrared heating will offer decided advantages, such as a 90% lower fuel cost and a 300% increase in production as compared with other types of equipment. In drying ammunition chests or similar metal chests, the infrared gas burner will dry the inside finish with the same speed and thoroughness as the outside, simultaneously. Similarly, wrinkle, hammerloid, clear, black, and white finishes and square, round, and odd-shaped objects of varying thicknesses of material can be run through side by side with perfect results and with no change of speed or temperature.

In the W. A. Barrows Porcelain Enamel Company, Cincinnati, Ohio, infrared heating equipment dries sprayed and dipped porcelain ware. The oven is 60 feet long, 6 feet 10 inches high, and 36 inches wide. Before the equipment was installed, heat was provided by an oil burner which fired into a brick chamber, exhausted through a horizontal stack running the length of the drier, then exhausted outside of the building. This system permitted a maximum of only 175°F. in the drier. Chain speed could not be increased more than 6 feet per minute on a ground coat; the cover-coat speed was only slightly faster.

An infrared gas burner equipped with blower and automatic controls was installed. Speed on the ground coat was immediately increased 33⅓%, i.e., to 8 feet per minute or more. This increase in chain speed was also accompanied by an approximate saving of 20% in gas consumption.

The installation was also employed to fire on a high production war job. Approximately 2000 lb. of sheet metal parts were run through the oven per hour. The firing operation was 4 feet per minute at a temperature of 425°F.

The infrared gas burner is designed so that a drying oven is in no way limited to a single size or shape of object and the burners need not be mounted so as to focus the infrared radiation to cover the objects completely.

In control of time and temperature, the infrared gas burner is unsurpassed because of its ability to control the B.t.u. input of the individual burner, thus controlling any set temperature over a wide range. On a normal infrared gas installation, any predetermined temperature can be obtained from approximately 175° to 400°F. by adjusting the temperature controller accordingly. It is possible, therefore, to apply more heat to an object without changing conveyer speeds or adding combustion equipment.

The use of recirculating systems with infrared gas burners is desirable, as the recirculation of hot air not only aids the speed of production and reduces fuel consumption but provides a pure oven atmosphere which continuously draws out all foul air.

The most important advantages of the infrared gas burner can be summed up as follows: (1) fuel consumption is unbelievably low, (2) reformulation of paints for use under this drying system is unnecessary, (3) the size and shape of the work and the thickness of material being processed has no bearing on speed and results, (4) it is not necessary to focus burners on actual surface, (5) pure oven atmosphere is always present, (6) a wide range of colors, finishes, shapes, and sizes can be run through simultaneously with excellent results, and (7) temperatures from 175° to 400°F. can be obtained by merely resetting the temperature controllers to allow a wide range of temperature and types of production without changing the speed of the conveyer.

A Grand Rapids company has operated an oven for approximately two years, including Sundays and holidays, without requiring maintenance. This oven, originally constructed to meet specific requirements, was indirect fired before conversion. It measured 180 feet long and had a floor conveyer that traveled 24 inches per minute. The paints used under these conditions were formulated for a cycle of 1½ hours at 300°F.

Conversion of the oven to infrared gas heating cut 100 feet from the length, making its over-all length 80 feet, counting the 10-foot vestibule air seal at each end. Two overhead monorail conveyers, traveling in opposite directions, were added, having a top speed of 10 feet per minute and a low speed of 8 feet per minute. They actually operate at 9 feet per minute under normal conditions. The floor conveyer, used for very heavy products, travels at 10 to 14 feet per minute. The oven operates four manifolds, each 25 feet long. Two manifolds on each side of the oven are 50 feet long.

This oven is exceedingly flexible. It will handle anything within the scope of the annual production of this plant from 150° to 450°F. Any temperature change, either up or down, can be accomplished in 7 minutes, thereby permitting a complete paint change within that period without stopping the line of production. The company has also found that they can run wood parts with the same ease and excellent results as steel and aluminum parts.

The conveyer speed will not permit the cure cycle to be longer than 6¼ minutes in the heat zone or 10 minutes over all, a far cry from the 1½ hours formerly required.

This plant produces such items as bomb fins, aircraft products, plywood and oak seats, radiator core housings, automobile fenders, fender brackets, radiator shells, and a range of hardware items. The total weight run through the oven is 46,375 pounds per hour. The temperature has never dropped, regardless of the size or kind of load. Colors on parts can also be matched more evenly since converting to infrared gas heating.

BURDETT MANUFACTURING COMPANY
19 NORTH LOOMIS STREET
CHICAGO 7, ILLINOIS

AMERICAN CERAMIC SOCIETY

Officers for 1945–1946

C. Forrest Tefft, President

James Edward Hansen, Vice-President

FORTY-SEVENTH ANNUAL MEETING OF THE AMERICAN CERAMIC SOCIETY, INC.

The Forty-Seventh Annual Meeting of The American Ceramic Society, Inc., was held in Buffalo, N. Y., Monday evening, April 16, 1945. War restrictions held the attendance from outside the Buffalo area to forty-one members. These were joined by one hundred and twenty-seven members of the Upstate New York Local Section to form a quorum for the transaction of business.

W. Keith McAfee offered a resolution to submit to the membership an amendment to the Constitution discontinuing the autonomous organization of the Fellows. This motion was passed, and the amendment is published on page 182 of this issue of *The Bulletin*.

President E. H. Fritz, in closing his term of office, addressed the membership with his recommendations for the near postwar years.*

The following members were presented to the membership as newly elected Fellows: FRANCIS WILLIAM PRESTON, WALTER CLARENCE RUECKEL, KENNETH CASSINGHAM LYON, WALTER ANTHONY WELDON, PAUL STANFORD DEAR, HANS THURNAUER, BURNHAM WILLIAM KING, JR., WESLEY GRINDELL MARTIN, EDWARD EARL CALLINAN, and WALDO WALLACE HIGGINS.

The new officers and trustees were inaugurated with appropriate ceremonies. They are as follows: C. FORREST TEFFT, *President*; JAMES EDWARD HANSEN, *Vice-President*; JOHN DANIEL SULLIVAN, *Treasurer*; and EDWIN M. RUPP and JOHN HENRY ISENHOUR, *Trustees*.

At this meeting, Dr. Clarence S. Ross, Chief of the Section of Petrology, United States Geological Survey, delivered the Edward Orton, Jr., Fellow Lecture. He discussed the "Minerals and the Mineral Relationships of the Clay Minerals."

The business meeting of the Board of Trustees began on Monday afternoon and continued to Tuesday. The first business was to accept the report of the committee discontinuing the autonomous organization of the Fellows. The report of this committee was read by L. E. Barringer, who recommended that several committees be established to carry on the activities which had previously been sponsored by the Fellows.

John D. Sullivan, Treasurer, read his report which showed that The Society had operated well within its income for the current year and was operating conservatively for the new year. He reported that already in 1945 $2000 had been invested in war bonds and that the surplus of The Society had increased more than $10,000 in the past year. Comments were made on this report, one being that The Society should attempt to build up its surplus to the equivalent of a budget for one full year of operation.

A committee headed by John L. Carruthers reported on the cooperation with the trade press by recommending that, although the Rules of The Society should be ob-

* See "The President's Address," *Bull. Amer. Ceram. Soc.*, **24** [4] 139–42 (1945).

AMERICAN CERAMIC SOCIETY

Officers for 1945–1946

John Daniel Sullivan, Treasurer

Ross Coffin Purdy, General Secretary and Editor

served as written, more close contact be maintained with the trade-press representatives and that any material which is not needed for The Society's publications be released to the other publications as soon as possible.

A committee appointed by the chairman of the Pittsburgh Local Section and headed by A. Paul Thompson reported, with recommendations for improving the cooperative relations of The Society and the Local Sections. The committee favored some financial support for the Local Sections as well as help with the organization of programs. The committee recommended the formation of a committee on Section activities to be composed of the chairmen of the various Local Sections.

Following this report, the Board of Trustees adopted a plan to give each Local Section a refund of one dollar from the annual dues of any member registered in the Local Section area and attending meetings.

Recommendation for two new Divisions of The Society which had been received during the year was discussed. The two suggested Divisions were the Steatite and Thermal Insulation Divisions. It was considered that a Division for the steatite industry would not be useful at this time and it was recommended that the members continue as a part of the White Wares Division. The field of thermal insulation is so broad that further study of such a grouping was recommended.

J. R. Beam reported on a liaison committee to contact the national bureaus on subjects pertaining to the ceramic industry. The members were urged to take their problems to the Bureau of Standards and Bureau of Mines for help.

Theodore Lenchner reported on the proposition to change the Design group from a Division of The Society to a Class. He indicated that further study was necessary before this matter could be acted upon.

The staff was instructed to continue with plans to secure the publication of a new group of phase diagrams and to combine them with those published in 1933 and 1938.

Ralston Russell, Jr., reporting for the Membership Committee, showed that a net gain of more than three hundred members was made in the past year. He asked for authorization to form regional membership committees to supplement the work of the Division committees. A revision of the membership application forms and the publication of a Society prospectus was also recommended.

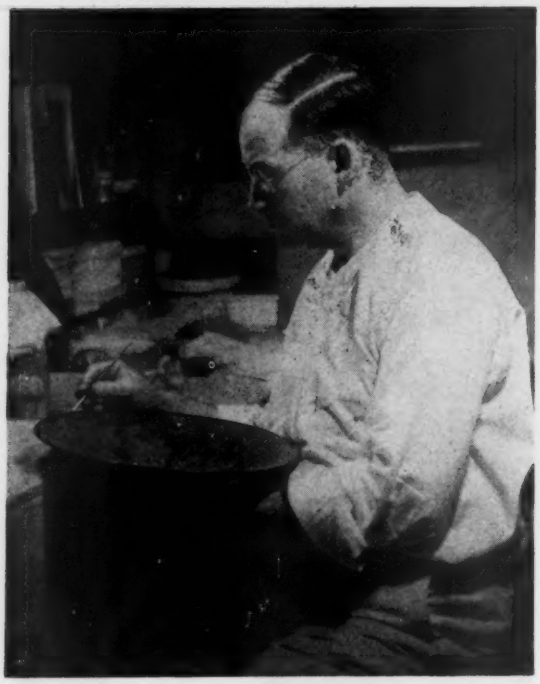
The report of the Committee on the Endowment Fund was presented by the chairman, V. V. Kelsey. This Committee did not recommend an endowment fund owing to the low rate of interest which can be earned by such funds today, but did recommend that the subject be studied further with the idea that a permanent research fund might be raised.

After considering the war restrictions on meetings this year, the Board decided that the Annual Meeting in 1946 should be held in Buffalo if restrictions were relaxed by that time.

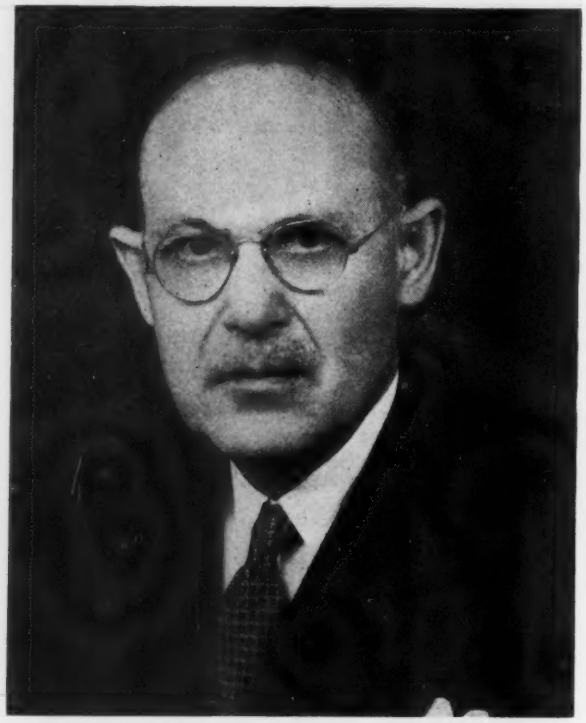
Modified reports were received from many of the Standing Committees and from the Institute of Ceramic Engineers and the Ceramic Educational Council.

The meeting was closed by the new President, C. Forrest Tefft.

DESIGN DIVISION



Walter Anthony Weldon, Trustee



Theodore Lenchner, Chairman

Vincent Broomhall, Vice-Chairman

Marion Lawrence Fosdick, Secretary

ENAMEL DIVISION

Roger Lee Fellows, Trustee

Clark Hutchison, Vice-Chairman

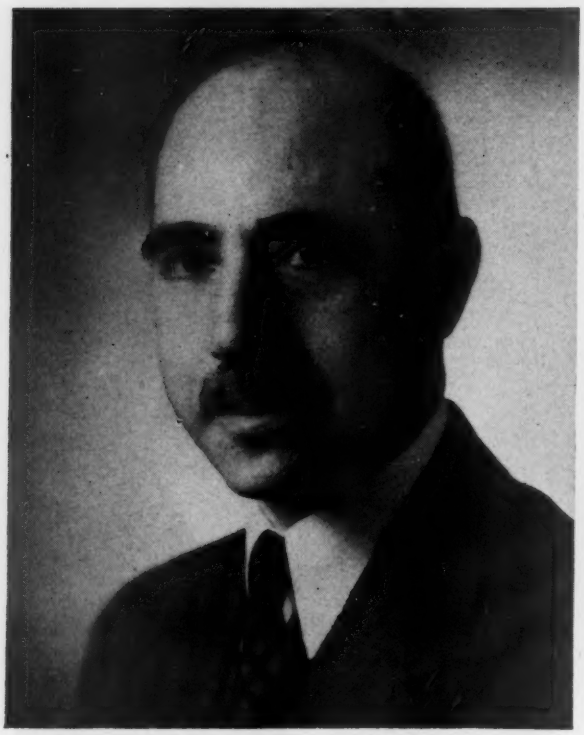
Waldo Wallace Higgins, Chairman

Dwight Garrison Moore, Secretary

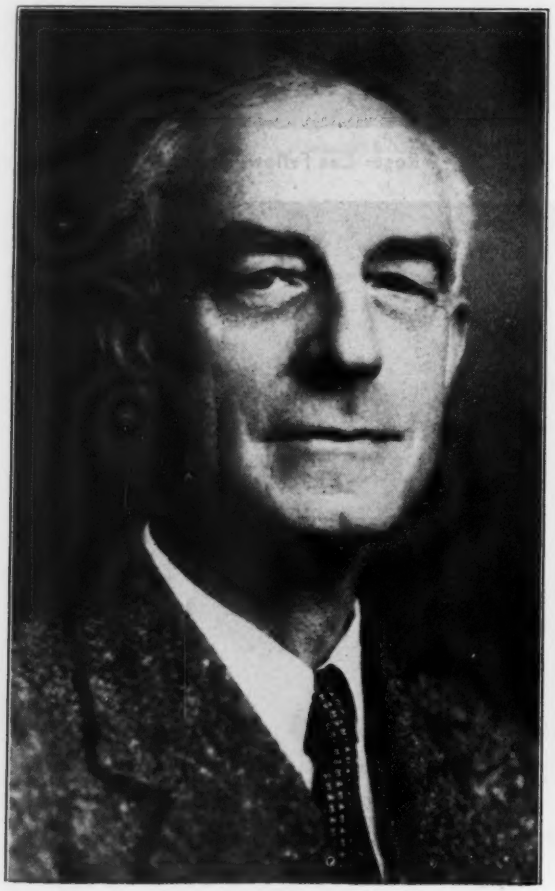
GLASS DIVISION

Joseph Scott Gregorius, Trustee

Oscar Gray Burch, Vice-Chairman



Louis Navias, Chairman



Samuel Ray Scholes, Secretary

MATERIALS AND EQUIPMENT DIVISION

Edwin M. Rupp, Trustee

Edwin M. Rupp was elected to the Board of Trustees this year to represent the Materials and Equipment Division. He has served on several committees of the Division. He represents the Clinchfield Sand & Feldspar Corporation and has headquarters in Columbus, Ohio.

Jack Franklin Day, Chairman

Victor Jerome Roehm, Vice-Chairman

W. E. Dougherty, Secretary

REFRACTORIES DIVISION

James Bliss Austin, Trustee

Stephen McKee Swain, Chairman

Edward Earl Callinan, Vice-Chairman

Charles Alfred Freeman, Secretary

STRUCTURAL CLAY PRODUCTS DIVISION

John Henry Isenhour, Trustee

Robert Likes Ferguson, Chairman

A. Curtis Jackson, Vice-Chairman

John Henry Isenhour was elected to the Board of Trustees this year to represent the Structural Clay Products Division. He has served as Chairman of the Division and was on the Membership Committee. He is a partner of the Isenhour Brick & Tile Company of Salisbury, N. C.

STRUCTURAL CLAY PRODUCTS DIVISION

George M. Norwood, Secretary

The Secretary of the Structural Clay Products Division is George M. Norwood of Raleigh, N. C. Mr. Norwood is a native of Goldsboro, N. C., and is president of the Rickman Brick Company at Lillington, N. C. He has been connected with the clay industry for twenty-two years.

The Ceramic Department of North Carolina State College has known him as an active supporter since the foundation of this Department, and he has employed many students from this school during the summer vacations.

Several years ago, Mr. Norwood was invited to attend a Meeting of The American Ceramic Society to see how things were done and who joined in such Meetings to make them a success. He has been a regular attendant ever since.

We regret that we were unable to obtain a photograph of Mr. Norwood in time for publication in this issue.

WHITE WARES DIVISION

James Wilson Hepplewhite, Jr., Trustee

Robert Morrell Campbell, Chairman

Claude Milton Lambe, Jr., Vice-Chairman

Edward Paul McNamara, Secretary

Andrew Irving Andrews, President

Paul Stanford Dear, Vice-President

Robert Morrell Campbell is Trustee of the Ceramic Educational Council. His photograph appears on the opposite page.

CERAMIC EDUCATIONAL COUNCIL

The officers of the Ceramic Educational Council, whose pictures are shown on this page, met at Buffalo Monday April 16, 1945, with several other members to consider some of the problems of their respective schools and of the ceramic industry in the immediate postwar period. Two important subjects were discussed, viz., the shortage of all trained technologists after the war and the changes that are necessary in curricula to meet the changing conditions of technical education.

It was pointed out that very few deferments had been granted to ceramic engineers and that few students were entering this field, none being allowed in the various army training programs. In consequence, there are few students in the ceramic departments at the present time. It is quite possible that less than ten persons will graduate in ceramic engineering this year, whereas in normal times as many as one hundred usually finished.

In the matter of curricula, the five-year course that is being introduced at Ohio State University in the Engineering Department and the complete reorganization of the curriculum of the Department at the University of Illinois were reviewed. It was shown that to include the so-called broadening courses that are being required today changes of this kind were necessary in the course of study. These approaches to the problem in two major ceramic schools of the country will be followed closely by the educators.

It was indicated at this meeting that changes of this kind may be required at the other schools represented. North Carolina, Alfred, and Iowa State.

Paul George Herold, Secretary

INSTITUTE OF CERAMIC ENGINEERS

Hobart McKinley Kraner, Trustee

Theron Albert Klinefelter, President

Charles Mitchener Dodd, Vice-President

Robert Twells, Secretary

STANDING COMMITTEES FOR 1945–1946

Executive Committee, Board of Trustees

C. FORREST TEFFT (*ex officio*): The Claycraft Co., Columbus 16, Ohio
E. H. FRITZ: Stupakoff Ceramic & Mfg. Co., Latrobe, Pa.
J. B. AUSTIN: Research Lab., U. S. Steel Corp., Kearny, N. J.
J. S. GREGORIUS: Pittsburgh Plate Glass Co., Pittsburgh 19, Pa.
J. E. HANSEN: Ferro Enamel Corp., Cleveland 5, Ohio

Finance Committee, Board of Trustees

J. E. HANSEN, *Chairman:* Ferro Enamel Corp., Cleveland 5, Ohio
J. D. SULLIVAN: Battelle Memorial Institute, Columbus 1, Ohio
J. B. AUSTIN: Research Lab., U. S. Steel Corp., Kearny, N. J.

Committee on Public Relations

V. V. KELSEY, *Chairman:* Dominion Minerals, Inc., Shoreham Bldg., Washington 5, D. C.
F. C. FLINT: Hazel-Atlas Glass Co., Washington, Pa.
H. M. KRANER: Bethlehem Steel Co., Bethlehem, Pa.
A. A. WELLS: Homer Laughlin China Co., Newell, W. Va.
J. E. EAGLE: War Production Board, Non-Metals Section, Washington, D. C.

Committee on Rules

W. KEITH MCAFEE, *Chairman:* Universal Sanitary Mfg. Co., New Castle, Pa. (assisted by the Chairman of the Rules Committee of each Class and Division)

Committee on Publications

R. L. STONE, *Chairman:* Univ. of North Carolina, Raleigh Unit, Raleigh, N. C.
HARRY THIEMECKE: Homer Laughlin China Co., Newell, W. Va.
W. A. WELDON: Locke Insulator Corp., Baltimore, Md.
K. C. LYON: Armstrong Cork Co., Millville, N. J.
R. C. PURDY (*ex officio*): *General Secretary,* The American Ceramic Society, Inc., Columbus 2, Ohio

Committee on Membership

RALSTON RUSSELL, JR., *Chairman:* Research Labs., Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.
C. S. PEARCE: *Executive Secretary,* The American Ceramic Society, Inc., Columbus 2, Ohio
(Assisted by the Chairman of the Membership Committee of each Class and Division)

Committee on Editorial Standards

A. P. THOMPSON, *Chairman:* Mellon Institute, Pittsburgh 13, Pa.
R. M. CAMPBELL: New York State College of Ceramics, Alfred, N. Y.

Committee on Standards

J. W. WHITTEMORE, *Chairman:* Virginia Polytechnic Institute, Blacksburg, Va. (assisted by members of the Standards Committee of each Class and Division)

Committee on Sections and Divisions

C. C. TREISCHEL, *Chairman:* R. T. Vanderbilt Co., New York 17, N. Y.
A. LEE BENNETT: Gladding, McBean & Co., Seattle, Wash.
E. W. EMRICH: R. T. Vanderbilt Co., Norwalk, Conn.
E. M. RUPP: Clinchfield Sand & Feldspar Corp., Columbus, Ohio
C. S. PEARCE: *Executive Secretary,* The American Ceramic Society, Inc., Columbus 2, Ohio
(Assisted by the Chairman of each Division and Section)

Committee on Research

J. L. CARRUTHERS, *Chairman:* Ohio State University, Columbus 10, Ohio (assisted by a member from each Division)

Committee on Geological Surveys

H. RIES, *Chairman:* 401 Thurston Ave., Ithaca, N. Y.
J. E. LAMAR: State Geology Div., Univ. of Illinois, Urbana, Ill.
O. C. RALSTON: Non-Metals Div., U. S. Bureau of Mines, Washington 25, D. C.
F. K. PENCE: Univ. of Texas, Austin, Tex.
HEWITT WILSON: Electrotechnical Lab., U. S. Bureau of Mines, Norris, Tenn.
NORMAN PLUMMER: State Geological Survey of Kansas, Lawrence, Kans.
A. F. GREAVES-WALKER: Office of Production Research & Development, War Production Board, Washington, D. C.

Committee on Classification, Nomenclature, and Glossary

M. F. BEECHER, *Chairman:* Norton Co., Worcester, Mass. (assisted by Class and Division representatives)

Committee on Ceramic Education

ALICE A. AYARS, *Chairman:* 12479 Cedar Rd., Cleveland Heights, Ohio (Art Member, 1 year)
H. M. KRANER: Bethlehem Steel Co., Bethlehem, Pa. (Engineering Member, 2 years)
R. M. KING: Ohio State University, Columbus 10, Ohio (Education Member, 3 years)
J. W. HEPPLEWHITE: Edwin M. Knowles China Co., Newell, W. Va. (Industry Member, 4 years)
P. S. DEAR: Virginia Polytechnic Institute, Blacksburg, Va. (Technology Member, 5 years)

Building Committee

V. V. KELSEY, *Chairman:* Dominion Minerals, Inc., Shoreham Bldg., Washington 5, D. C.
A. A. WELLS: Homer Laughlin China Co., Newell, W. Va.
R. A. WEAVER: Ferro Enamel Corp., Cleveland 5, Ohio
C. E. BALES: Ironton Fire Brick Co., Ironton, Ohio

Committee on Industrial Management

J. E. HANSEN, *Chairman:* Ferro Enamel Corp., Cleveland 5, Ohio
J. H. ISENHOUR: Isenhour Brick & Tile Co., Salisbury, N. C.
(Assisted by a member from each Division)

Committee on Patents

F. B. FLICK, *Chairman:* 1706 First National Bank Bldg., Pittsburgh, Pa.
C. F. GEIGER: Carborundum Co., Perth Amboy, N. J.
R. E. BIRCH: Harbison-Walker Refractories Co., Pittsburgh 22, Pa.

Committee on Film Library

H. E. SIMPSON, *Chairman:* Mellon Institute, Pittsburgh 13, Pa.
J. W. JORDAN: Mellon Institute, Pittsburgh 13, Pa.
R. C. PURDY: *General Secretary,* The American Ceramic Society, Inc., Columbus 2, Ohio

Committee on Air Hygiene

F. C. FLINT, *Chairman:* Hazel-Atlas Glass Co., Washington, Pa.
EDWARD SCHRAMM: Onondaga Pottery Co., Syracuse 4, N. Y.

R. L. FELLOWS: Chicago Vitreous Enamel Product Co., Cicero 50, Ill.
L. H. MILLIGAN: Norton Co., Worcester 6, Mass.

Committee for the Design Division
W. A. WELDON, *Chairman:* Locke Insulator Corp., Baltimore, Md.
W. KEITH MCAFEE: Universal Sanitary Mfg. Co., New Castle, Pa.
V. V. KELSEY: Dominion Minerals, Inc., Shoreham Bldg., Washington 5, D. C.
F. C. FLINT: Hazel-Atlas Glass Co., Washington, Pa.
A. A. WELLS: Homer Laughlin China Co., Newell, W. Va.
R. A. WEAVER: Ferro Enamel Corp., Cleveland 5, Ohio
R. E. JORDAN: Mosaic Tile Co., Matawan, N. J.

APPOINTED REPRESENTATIVES FOR 1945–1946

American Association for the Advancement of Science
R. C. PURDY: *General Secretary,* The American Ceramic Society, Inc., Columbus 2, Ohio

American Foundrymen's Association
Research Committee on Foundry Sand: H. M. KRANER, Bethlehem Steel Co., Bethlehem, Pa.

American Society for Testing Materials
Committee A–1 on Steel: GILBERT SOLER, Steel & Tube Div., Timken Roller Bearing Co., Canton 6, Ohio
Committee C–4 on Clay Pipe: C. M. DODD, Iowa State College, Ames, Iowa
Committee C–5 on Fire Tests of Materials and Construction: R. A. SHIPLEY, National Fireproofing Corp., Pittsburgh, Pa.
Committee C–6 on Drain Tile: J. L. CHILD, Hancock Brick & Tile Co., Findlay, Ohio
Committee C–7 on Lime: C. R. AUSTIN, Battelle Memorial Institute, Columbus 1, Ohio
Committee C–8 on Refractories: L. C. HEWITT, Lacledé-Christy Clay Products Co., St. Louis, Mo.
Committee C–11 on Gypsum: C. M. LAMBE, JR., U. S. Gypsum Co., Pittsburgh, Pa.
Committee C–14 on Glass and Glass Products: G. W. MOREY, Geophysical Laboratory, Washington 8, D. C.
Committee C–15 on Manufactured Masonry Units: H. C. PLUMMER, Structural Clay Products Institute, Washington 6, D. C.
Committee D–3 on Gaseous Fuels: A. W. GAUGER, Pennsylvania State College, State College, Pa.
Committee D–5 on Coal and Coke: A. W. GAUGER.
Committee D–9 on Electrical Insulating Materials: LOUIS NAVIAS, General Electric Co., Schenectady, N. Y.

American Society of Mechanical Engineers
Petroleum Division: H. R. STRAIGHT, Straight Engineering Co., Adel, Iowa.
Process Division: W. KEITH MCAFEE, Universal Sanitary Mfg. Co., New Castle, Pa.

American Standards Association
Sectional Committee on Specifications for Drain Tile (Project A–6): J. L. CHILD, Hancock Brick & Tile Co., Findlay, Ohio
Sectional Committee on Minimum Requirements for Plumbing and Standardization of Plumbing Equipment (Project A–40): HARRY WHITTAKER, Koebel Diamond Tool Co., Detroit 13, Mich.
Sectional Committee on Recommended Practice for Brick Masonry (Project A–41): H. C. PLUMMER, Structural Clay Products Institute, Washington 6, D. C.
Sectional Committee on Coordination of Dimensions of Building Materials and Equipment (Project A–62): FREDERICK HEATH, JR., Owens-Corning Fiberglas Corp., Toledo, Ohio
Sectional Committee on Insulators for Electric Power Lines (Project C–29): G. W. LAPP, Lapp Insulator Co., Inc., Le Roy, N. Y.
Sectional Committee on Scientific and Engineering Symbols and Abbreviations (Project Z–10): W. C. RUECKEL, Koppers Co., Pittsburgh 19, Pa.
Sectional Committee on Specifications for Sieves for Testing Purposes (Project Z–23): J. F. MCMAHON, New York State College of Ceramics, Alfred, N. Y.
Sectional Committee on Specifications and Methods of Test for Safety Glass (Project Z–26): GEORGE WATKINS, Libbey-Owens-Ford Glass Co., Toledo, Ohio; D. E. SHARP, Libbey-Owens-Ford Glass Co., Toledo 5, Ohio (alternate)

International Association for Testing Materials
S. M. PHELPS: Mellon Institute, Pittsburgh 13, Pa.

International Commission on Glass Technology
J. C. HOSTETTER: Mississippi Glass Co., St. Louis 7, Mo.

Inter-Society Color Council
I. A. BALINKIN, *Chairman:* University of Cincinnati, Cincinnati 21, Ohio
H. D. CALLAHAN: U. S. Quarry Tile Co., East Sparta, Ohio
W. E. DOUGHERTY: O. Hommel Co., Pittsburgh, Pa.
R. S. HUNTER: National Bureau of Standards, Washington 25, D. C.
N. J. KREIDL: Bausch & Lomb Optical Co., Rochester 2, N. Y.
L. H. MILLIGAN: Norton Co., Worcester 6, Mass.
V. H. REMINGTON: B. F. Drakenfeld & Co., Inc., Washington, Pa.
CAMPBELL ROBERTSON: E. I. du Pont de Nemours & Co., Inc., Perth Amboy, N. J.
EDWARD SCHRAMM: Onondaga Pottery Co., Syracuse 4, N. Y.
A. S. WATTS: Ohio State University, Columbus 10, Ohio
WOLDEMAR WEYL: Pennsylvania State College, State College, Pa.

Illuminating Engineering Society and Luminous Glassware Guild
H. H. BLAU, *Chairman:* Federal Glass Co., Columbus 7, Ohio
R. A. MILLER: Pittsburgh Plate Glass Co., Pittsburgh 19, Pa.
R. R. SHIVELY: B. F. Drakenfeld & Co., Inc., Washington, Pa.

National Research Council
Division of Geology and Geography: G. W. MOREY, Geophysical Laboratory, Washington 8, D. C.
Division of Chemistry and Chemical Technology: G. W. MOREY

Orton Foundation Board
L. E. BARRINGER: General Electric Co., Schenectady, N. Y.

United States Department of Commerce, Division of Simplified Practice, Permanent Committee on Simplification of Variety and Standards of Vitrified Paving Brick
C. C. BLAIR: Metropolitan Paving Brick Co., Canton, Ohio

C. FORREST TEFFT, PRESIDENT OF THE AMERICAN CERAMIC SOCIETY FOR 1945–1946

C. Forrest Tefft, President of The American Ceramic Society for 1945–1946, was born in Belmont, N. Y., August 11, 1889. He studied at the New York State College of Ceramics in 1908 to 1909 and from 1911 to 1914, receiving the degree of B.S. in Ceramics in 1914.

He was awarded the professional degree of ceramic engineer from the New York State College of Ceramics in 1937.

From 1900 to 1911, Mr. Tefft was employed by the Ludowici-Celadon Company at Alfred, N. Y., and Coffeyville, Kans. From 1914 to 1915, he was superintendent of the Ridgway Brick Co., Ridgway, Pa. For the next five years, he was manager of the Darlington Clay Products Co., Darlington, Pa.

Between 1920 and 1924, he was assistant factory manager of Fiske & Co., Inc., Watsontown, Pa., and in 1924 he became factory manager.

Following a year of work as consulting ceramic engineer, Mr. Tefft was made general factory manager of the Claycraft Co., Columbus, Ohio. Three years later, in 1929, he became general manager of the Company. From 1936 to 1943, he served as vice-president and general manager.

In November, 1943, Mr. Tefft acquired control and was elected president of the Claycraft Company, which owns and operates three large structural clay product factories in Ohio. Ware from these three factories is shipped from coast to coast and some of the material is exported.

Society Activities

Mr. Tefft joined The American Ceramic Society in 1913, becoming an Active Member in 1920. He is also a Fellow of The Society. He was Secretary at the organization of the Heavy Clay Products Division in 1921, Chairman of the Division in 1922, and Trustee from 1924 to 1926. He served as Treasurer of The Society from 1936 to 1944 and as Vice-President during 1944–1945.

Mr. Tefft has been associated, as trustee or officer, with the Ohio Ceramic Industries Association since its origin; he served three years as president. He is also an honorary member of Keramos and a member of the Institute of Ceramic Engineers.

Civic Activities

Active in civic affairs, Mr. Tefft is serving as vice-mayor of Upper Arlington, Columbus, Ohio (second of two four-year terms); chairman of the Safety and Park Committees, Upper Arlington; and Trustee of the First Community Church, Columbus, Ohio.

He is past-president of the Columbus Builders Exchange, director of the Columbus Chapter of Kiwanis International, member of the Faculty Club, Ohio State University, the University Club, and the Scioto Country Club, all of Columbus, Ohio.

He is also Trustee of Alfred University, Alfred, N. Y., and on the Board of Managers of the New York State College of Ceramics, Alfred, N. Y.

Publications

(1) (With E. T. Montgomery), "Roofing Tile Slips and Glazes," *Trans. Amer. Ceram. Soc.*, **16**, 144–50 (1914).

(2) (With R. H. Hearing), "Items Requiring Consideration in Underground Clay Mining," *Jour. Amer. Ceram. Soc.*, **10** [11] 919–23 (1927).

(3) "Development of the Shale Planes," *ibid.*, **11** [10] 785–90 (1928).

Patent

(1) "Building Block," U. S. 2,198,399, April 23, 1940.

NOTES FOR CERAMISTS

RESEARCH IN LEADLESS GLAZES

For more than two years the United States Potters Association has maintained a Fellowship at the Ohio State University Engineering Experiment Station, Columbus, Ohio. The Fellow, John Marquis, has been working on low-lead and leadless glazes and has made substantial progress.

This work has assumed more than usual importance owing to the restrictions on the use of lead in the ceramic industry which went into effect recently. In fact, it is doubtful if the pottery industry could have operated at its present rate without the results of this work.

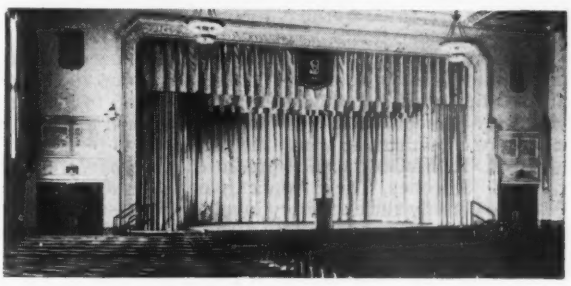
A. V. Bleininger was responsible for the beginning of this study, and J. W. Hepplewhite is the present chairman of the Research Committee of the Association.

It is rather unusual for research work to be so far advanced when emergencies arise. Normally the emergency demands that the research work be done. This project is an example of what can be done by forethought in technical development. The same vision can help other branches of the ceramic industry.

THE AMERICAN CERAMIC SOCIETY
FOR CONTINUING EDUCATION
IN CERAMICS

FIBERGLAS FOR FIRE PROTECTION

A fire-safe jade-green Fiberglas curtain and backdrop have been installed on the auditorium stage of the Von Steuben High School, Chicago, Ill. This installation, the first of its kind, was brought about by the potentially tragic effects of several school auditorium fires in the Chicago area. The window curtains in the auditorium are also of jade-green Fiberglas.



Fiberglas curtain and backdrop installed on auditorium stage of the Von Steuben High School, Chicago, Ill.

LOCAL SECTIONS

NORTHERN OHIO SECTION

April Meeting

Forty-eight members and guests sat down to dinner in the Cleveland Engineering Society dining room at the meeting of the Northern Ohio Section held April 5. Later arrivals swelled the attendance at the technical session to approximately sixty.

The feature of the evening was a talk on "The Industrial Revolution in Brickmaking" by Raymond E. Birch, assistant director of research of the Harbison-Walker Refractories Co., Pittsburgh, Pa. This talk interestingly traced the early development of present clayworking equipment through a period from about 1740 to 1870 and was illustrated with slides.

Before the technical session, J. C. Strasbourger, chairman of the Visitation Committee of the Cleveland Technical Societies Council, outlined some of the activities which the Council has under way at the present time and in which work we are sharing through our participation as a member society.

In compliance with the ODT request, the Annual Meeting of The American Ceramic Society, previously scheduled to be held the week of April 15 in Buffalo, N. Y., was cancelled and only committee meetings were held at this time. The papers which would have been given at the Annual Meeting are being presented before various Local Sections, and it is our plan to schedule a full program of such papers for one of our meetings in the autumn, possibly the first meeting in October. The Chairman would like to hear from any of our members who are preparing papers which might be presented at that time.

May Meeting

Our next regular meeting, the last before the summer recess, was held May 11 at the Cleveland Museum of Art. At that time, the annual May Art Show was in progress at the Museum, presenting the work of Cleveland artists. The director of the Museum, William M. Milliken, talked on "Ceramics in the May Show," following which small groups were conducted through the Show by members of the Museum staff. Alice A. Ayars, who exhibited in this year's Show and has repeatedly been a prize winner in previous years, was in charge of arrangements.

—EDWARD M. SARRAF, *Chairman*

PITTSBURGH SECTION

The regular April meeting of the Pittsburgh Section was held at Mellon Institute April 10, preceded by a buffet dinner at Webster Hall Hotel with sixty-four in attendance at the dinner and ninety present for the meeting.

At the business meeting, a report was presented by A. P. Thompson, chairman of the committee appointed to investigate a better relationship between the local group and the National Society. This contained several recommendations to be presented to the National Society officers, and, after a discussion, this report was adopted.

The secretary described the Pittsburgh Technical Calendar and explained the cost of listing our group meetings and mailing which would amount to from $25 to $30 per year over present costs. The matter was referred to the executive committee to study the situation.

Dr. R. R. McGregor then presented a very interesting talk on "Silicones, Their Application to Ceramics." He described briefly the chemistry involved in these relatively new silica-plastics and described the wide variety of materials developed to date. He also demonstrated a number of these silicones ranging from a very thin liquid to a stiff plastic with unusual properties of resilience. Various applications to ceramics were also discussed.

—HOWARD M. PARKHURST, *Secretary*

BALTIMORE-WASHINGTON SECTION

As there was no Annual Meeting of The American Ceramic Society this year, we decided to enlarge the program of our spring Section meeting. The meeting will take place Saturday, June 2, at the Lord Baltimore Hotel, Baltimore, Md.

A three-hour afternoon session will start at 2:00 P.M. This session will be opened and high-lighted by a talk by Dr. James Hillier of the R.C.A. Laboratories on the subject "The Electron Microscope and Further Developments in Microanalysis." Although the usage of this relatively new instrument is rather uncommon in the ceramic industry today, its usage, no doubt, will be extended as its great magnification and resolving power can be an important aid to the ceramist in studying the problems of surface finishing and interreaction of finely ground ceramic-mix ingredients.

The remainder of the afternoon session will be devoted to a number of papers representative of the various ceramic divisions.

A dinner and business meeting including the election of Section officers for 1945–1946 will follow, after which Dr. C. S. Ross, Chief, Section of Petrology, U. S. Geological Survey, will deliver the annual Orton Fellow Lecture on "Minerals and Mineral Relationships of the Clay Minerals," which was originally scheduled for the cancelled Forty-Seventh Annual Meeting.

We extend an invitation to everyone interested in ceramics, whether he is a member of this Local Section or not, to attend this meeting. Reservations at $3 per person, which includes the registration fee, cost of dinner, tip, etc., can be made with W. A. Weldon, 621 Edgewood St., Baltimore 29, Md. Ladies are cordially invited.

—C. B. SHELLEY, *Secretary*

NORTHWESTERN OHIO SECTION

The next meeting of the Northwestern Ohio Section will be held at the Mohawk Golf Club in Tiffin, Ohio, Friday, June 8, 1945. Golf will be played in the afternoon if the weather permits; dinner and a technical session will follow in the evening.

This meeting will close a successful first year for the Northwestern Ohio Section. A splendid program is already being planned for the next season starting in October, 1945.

CENTRAL OHIO SECTION

The Central Ohio Section will meet May 23, 1945, at the Granville Inn, Granville, Ohio.

Papers from the Forty-Seventh Annual Program will be presented at afternoon and evening sessions.

ST. LOUIS SECTION

The St. Louis Section met at the Forest Park Hotel, Thursday, May 10, with dinner at 6:30 P.M. The Committee consisting of L. C. Hewitt, J. L. Crawford, P. G. Herold, and R. S. Bradley presented the By-Laws for the Section.

L. E. Puntney of the Laclede-Christy Clay Products Company talked on "Prospecting for and Testing Clay Samples from Missouri Clay Deposits."

J. E. Hansen, Service Director of the Ferro Enamel Corporation and vice-president of The American Ceramic Society, addressed the meeting.

Charles S. Pearce, Associate Secretary of The Society, was present.

Rudy L. Nordmeyer, President

Forrest K. Pence, Secretary-Treasurer

CERAMIC SOCIETY OF THE SOUTHWEST

The sixth program meeting of the Ceramic Society of the Southwest was held March 16 and 17. On March 16, plant visitation was featured by visits to the following plants: Harbison-Walker Refractories Co., Athens, Texas; General Refractories Co., Troup, Texas; Garrison Brick and Tile Co., Garrison, Texas; and Marshall Brick Co., Marshall, Texas.

At the plant of the Garrison Brick and Tile Company a barbecued chicken lunch was served as a courtesy of the Company to the membership.

At 7.30 P.M. a dinner session was held at Hotel Marshall. A feature of the dinner was an illustrated paper on the subject of Modular Masonry presented by Gus Demarest, Secretary-Engineer for the Clay Products Association of the Southwest.

On March 17 a program session was held at which a number of papers were presented on various plant problems as follows:

(1) "Lamination" by BOB GOEN.
(2) Discussion by FRANK MAHURIN.
(3) "Grinding Equipment" by EUGENE WARD.
(4) "Female Labor vs. Male Labor" by BOB BREWER.
(5) "What Is Proper Lubricant for Drier Cars?" by WINFREY HOLMES.
(6) "Process of Pugging Clay" by H. R. STRAIGHT.
(7) "What Number of Work Hours Is Most Efficient?" by LUKE REASONER.
(8) "Proper Banding of Round Kilns" by LEO FRANZ.
(9) "Lineshaft vs. Individual Drives" by RAY PAFFORD.
(10) "What Is the Best Type of Brick Barrow?" by JESS KEAHEY.
(11) "How Should Tile Be Loaded in Cars?" by E. J. ROBINETT.
(12) "Round Downdraft Kiln vs. Rectangular Downdraft Kiln" by T. J. ORRENDER.
(13) "What Are the Causes and Cure of Crooked Cuts on Cutter?" by RUSSELL WOODS.
(14) "What Is Best Method of Mixing Two or More Dissimilar Clays?" by LELAND SMITH.
(15) "What Is Best Method of Providing Dry Clay for Dry-Pan Grinding?" by RAY PAFFORD.
(16) "Building Up of Worn Parts, Augers, etc., by Electric Welding" by JESS EDWARDS.

At the business session, election of officers was held as follows:

President: RUDY L. NORDMEYER, Valley Brick and Tile Co., Mission, Texas.
Vice-President: T. J. ORRENDER, Garrison Brick and Tile Co., Garrison, Texas.
Executive Committee: CLAY DAVIS, Elgin Standard Brick Co., Elgin, Texas, and CHARLES SEWELL, Acme Brick Co., Malvern, Ark.
Secretary-Treasurer: F. K. PENCE, Director of Ceramics, University of Texas, Austin, Texas.

Adjournment was taken to meet in Austin sometime in October.

—F. K. PENCE, *Secretary-Treasurer*

FORTY-SEVENTH ANNUAL PROGRAM

Supplementary Titles*

1. Continuous Tank for Hand-Blown Glass

By F. W. Schwalbe: Toledo Engineering Company, Inc., Toledo 6, Ohio

The quality of glass obtainable from a continuous glass-melting furnace depends on raw materials, fuels, furnace design and operation, and skill in the art of gathering and manipulating molten glass. Of these requirements, the contents of the present paper are limited to information on furnace design and construction and their effect on the ultimate quality of the glass that can be produced when proper fuel, raw materials, and labor are employed.

2. Refractory Properties of Southern Sillimanite Concentrates

By T. N. McVay, Dorothy R. Pate, and Dan Allen: Electrotechnical Laboratory, Bureau of Mines, Norris, Tenn.

Sillimanite schist samples from Pelzer, South Carolina, and from near Bowman, Georgia, were beneficiated by the Southern Experiment Station of the Bureau of Mines. A minus 28-mesh concentrate containing 96% sillimanite was produced.

Refractories made from the raw sillimanite met both the A.S.T.M. and Navy reheat specifications for superduty refractories. The results of the high-temperature load tests indicated that the sillimanite brick had excellent load-carrying capacity at elevated temperatures and in the alumina-silica class are probably exceeded only by electrocast corundum-mullite. After a remarkably small volume change to 1600°C., the brick attained a maximum volume of sillimanite to mullite and cristobalite or siliceous glass. The pyrometric cone equivalent was 36. The tests were made in cooperation with the Georgia Department of Mines, Mining, and Geology, State Division of Conservation, and the Tennessee Valley Authority.

3. Canadian Brucite as Material for Production of Basic Refractories

By M. F. Goudge and J. G. Phillips: Mines Branch, Ottawa, Ontario, Canada

With the establishment of the plant at Wakefield, P. Q., for the extraction of brucite magnesia from brucite limestone, an economical source of a high-magnesia (92 to 96% MgO on the loss-free basis) raw material became available in Canada for the production of basic refractories. The brucite magnesia as extracted is in granular form, and this paper gives the results of studies of the chemical and mineralogical nature of the extracted granules with the object of determining the factors to be considered when processing them for the production of basic refractories. The investigation was carried out with the following purposes in view: (1) finding the most advantageous method of compounding and producing brick from the granules, and (2) tests (including service tests) on the brick.

4. New Facts Regarding Oklahoma Clays for the Ceramic Industries

By A. L. Burwell and W. E. Ham: Oklahoma Geological Survey, Norman, Okla.

The status of available information on Oklahoma glass sands, limestone, and dolomite is summarized, with emphasis on their relation to the ceramic industry and to the availability of auxiliary materials and fuel. Analyses and distributions of these materials are given, and locations are shown on an accompanying map.

5. Method for the Creation of Geometric Designs Based on Structure

By Edwin M. Blake: Mount Kisco, N. Y.

The method rests on a study, made by the author during the past several years, to discover, collect, and classify the geometrical figures and ideas of value to artists and designers in the field of geometric or abstract art, i.e., design that does not employ plant or animal forms, the human figure, or landscapes. The whole program embraces modeling and sculpture, drawing and painting, with their applications to pottery design and decoration, and abstract "movies." The basis of the method is the concept of structure, introduced into geometry in 1847. Geometrical structure is similar to the anatomical structure of the human hand; one structure is capable of assuming a great variety of forms.

In making a surface design, for example, the designer selects a line structure that seems to be suitable. This consists of a definite number of lines connected together in definite ways, but is otherwise free to take any form. The designer endeavors to throw the selected structure into a satisfactory form. To assist him are types of curves and angles suggestive of what is possible. Having a given number of lines and their connections, specific form, to be determined by the designer, stimulates creative activity. If variations of color over domains (areas) are to be employed, they can be designed as accurately as any other feature.

6. Dimensional Coordination

By M. W. Adams and Prentice Bradley: Modular Service Association, 10 Arlington St., Boston 16, Mass.

The method developed by American Standards Association Project A62 for coordinating standard sizes of building products and for correlating the layout and design of buildings is described. Applications of the method to masonry and windows are discussed.

7. Effect of Migration of Clay Minerals and Hydrous Aluminum Oxides on Complexity of Clay

By V. T. Allen: U. S. Geological Survey, Washington 25, D. C.

8. Absorption by the Use of Kerosene and a Vacuum

By Mark Sweitzer: Scio Ohio Pottery Co., Scio, Ohio

9. Alunite as a Source of an Unusual Scumming on a Stoneware Body

By Jan O. Knizek and H. Fetter: Cía. Mexicana de Tubos de Albañal, S. A., Apartado Postal 1402, Mexico, D. F.

A heavy disagreeable scumming developed on the surface of stoneware articles. This scum, having the appearance of a wrinkled skin, prevented the body from taking the salt glaze because of its refractory character. It consisted almost entirely of the mineral anorthite, and its formation is attributed to the alunite content of the clay.

* Supplementary titles to the Forty-Seventh Annual Program published in *Bull. Amer. Ceram. Soc.*, **24** [3] 95–106 (1945).

MEMBERS IN SERVICE

Each month we publish the additions to the list of members in service. The latest group, shown in this issue on p. 182, brings the total to 431.

The publications of The Society are being sent to 169 persons in service who maintain a regular personal membership. All receive a letter once each month which discusses the industry and gives a brief news account.

These men are interested in the ceramic industry. They want to keep in touch with it. Many are students who never had a chance to work in plants or laboratories. All are interested in what the industry is doing.

You can help. Go over the list (it started in *The Bulletin*, September, 1942), pick out the ones you know, and write to them. If you do not know anybody, pick out several at random. They will all be glad to hear from you.

We can furnish service addresses if you will write to us. Let's keep these men in touch with the industry!

PAID MEMBERSHIP AND SUBSCRIPTION RECORD

Date of Record	Members Paid		Deferred	Subscriptions	Monthly Sales	Total Circulation
	Personal	Corporation				
April 21, 1944	1996	344	3	560	220	3123
December 21, 1944	2317	402	2	661	220	3602
January 21, 1945	2368	404	3	670	220	3665
February 21, 1945	2409	408	2	688	220	3727
March 21, 1945	2103	391	3	647	220	3364
April 21, 1945	2238	400	3	598	220	3459
12-month % increase	12.1%	16.3%		6.8%		10.8%

NEW MEMBERS IN APRIL

Corporation

HAMILTON POTTERIES, LTD., H. Redshaw (voter), 100 Locke St., Hamilton, Ontario, Canada.

SNEAD, JANE, CERAMIC STUDIO, Thomas S. Snead (voter), 1822 Chestnut St., Philadelphia, Pa.

Personal

BOETTNER, GEORGE B., 273 Chestnut St., Corning, N. Y.; Corning Glass Works.

BRAZ, JACK J., 128 West 24th St., New York, N. Y.; De Lite Manufacturing Co., Inc.

CUNNINGHAM, EUGENE E., Greenfield Ave., R. D. 2, Newark, Ohio; Owens-Corning Fiberglas Corp.

EHLERS, ALFRED W. G., 100 Belsize Rd., London, N.W. 6, England; ceramist, Ehlers Laboratories & Studios.

GHORMLEY, GLEN E., 139 N. Chester Ave., Pasadena 4, Calif.; Altadena Kilns.

HANSON, PAUL M., JR., 18 Gosnold St., Worcester 6, Mass.; Norton Company.

PLATT, DONALD L., "Endcliffe," Granville Ave., Newcastle-u-Lyme, North Staffordshire, England; tile manufacturer, Diamond Clay Co., Ltd.

ROSENTHAL, ERNST, 246 Park West, Marble Arch, London W. 2, England.

SCOTT, FRANCES, 1507 Grant Ave., San Francisco, Calif.

STOCKSLAGER, THEODORE F., 24838 West Lake Rd., Bay Village, Ohio; Carborundum Company.

STURGEON, WALTER L., Corrientes 378, Buenos Aires, Argentina, S. A.; Allied Argentina S. A.

VEREBES, ERNO, Hedi Schoop Art Creations, Box 384, North Hollywood, Calif.

WHITCOMB, ROBERT L., JR., 732 W. Pasadena St., Flint, Mich.; A C Spark Plug Div., General Motors Corp.

*WYCKOFF, WILBUR R., 329 Prince George St., Laurel, Md.

Student

Ohio State University: *JOHN B. TAYLOR.

University of California: TRESSA H. CRAMER, GRACE B. DAFOE, WALTER A. HEIDRICH, ANNA R. MCDONALD, DOROTHY MOW, ALICE PARISA, J. E. PECK.

MEMBERSHIP WORKERS' RECORD

CORPORATION: Office 2.

PERSONAL: Theodore Lenchner 1, Richard H. Martin 1, Elwyn L. Maxson 1, Harold E. Riegger 1, Ralston Russell 1, E. M. Sarraf 1, Karl Schwartzwalder 1, R. L. Shute 1, W. E. S. Turner 1, C. G. Wurtsbaugh 1, Office 4.

STUDENT: Willi M. Cohn 7, Office 1.

GRAND TOTAL: 24.

* Indicates former member of The Society rejoining.

ROSTER CHANGES IN APRIL*

BLUME, CAPT. ARTHUR J., Fort Hayes, Ohio (Huntington, W. Va.)

BOTVINKIN, OLEG K., Ljalin 8, App. 19, Moscow 64, U.S.S.R. (New York, N. Y.)

DAVIS, HARRY E., Continental Kilns, Inc., Box 292, East Liverpool, Ohio (Newell, W. Va.)

DAVIS, SAMUEL L., Box 1685, San Francisco, Calif. (Glendale, Calif.)

DRAKE, ARTHUR D., 243 W. North Ave., East Palestine, Ohio (New Galilee, Pa.)

EATHERTON, C. Z., 861 Center St., Manhattan Beach, Calif. (Antioch, Ill.)

FOOTE, PAUL C., 714 Prospect Ave., Lake Bluff, Ill. (Chicago, Ill.)

FULCHER, GORDON S., 600 North 22d St., Philadelphia 30, Pa. (Belmont, Mass.)

GOIN, LT. (JG) FRED L., New York, N. Y. (Norfolk, Va.)

GRODSKY, JAMES W., 1722 Wisconsin Ave., N.W., Washington 7, D. C. (Arlington, Va.)

JONES, EDMUND, JR., Atlas Lumnite Cement Co., 1617 Pennsylvania Blvd., Broad Street Station Bldg., Philadelphia 3, Pa. (Chicago, Ill.)

KIRSCH, LT. ALPHONSE J., USNR, Pensacola, Fla. (New York, N. Y.)

MARLEY, HENRY E., Box 145, Alfred, N. Y. (Hornell, N. Y.)

RAY, JOHN G., 329 Wellington Rd., Mineola, Long Island, N. Y. (Emporium, Pa.)

UPTON, LEE O., 112 Weaver Court, Johnstown, Pa. (Rochester, N. Y.).

WEIS, J. H., 90 Hamilton St., Cambridge 39, Mass. (Kings Mountain, N. C.)

WYGANT, O/C JAMES F., Fort Benning, Ga. (University, Ala.)

* Address in parentheses is former address.

AMENDMENT TO THE CONSTITUTION*

Amend Section (1) (*c*) of Article III of the Constitution to read as follows:

Fellows shall be persons of at least thirty years of age who shall have been members at least five years and who shall prove qualified for elevation to the grade of Fellow by reason of outstanding contributions to the ceramic arts or sciences. They shall be elected by the Board of Trustees in the manner provided in the By-Laws. Fellows shall be entitled to use the title "FELLOW OF THE AMERICAN CERAMIC SOCIETY," or the abbreviation "F.A.CER.S."

Eliminate in its entirety Article IX.

* See also *Bull. Amer. Ceram. Soc.*, **23** [10] 389 (1944).

MEMBERS IN SERVICE*

The following members of this Society are in fighting units of war service. There are several in service in Washington not included in this Service Roster. This list, which was begun September, 1942, and added to each succeeding month, is probably not complete, and we would appreciate information on other members.

(426) JAMES W. GRODSKY, U. S. Navy Radio School, Chicago, Ill.
(427) WILFRID MAVOR, Ferro Enamels (Canada), Ltd., Ottawa, Ontario, Canada.
(428) F. G. MERTENS, Missouri School of Mines and Metallurgy, Rolla, Mo.
(429) QUENTIN E. NELSON, University of Texas, Austin, Texas.
(430) JACK PITTMAN, Box 986, Lewistown, Montana.
(431) RICHARD S. ROWE, Harbison-Walker Refractories Co., Frankfort, Ind.

* These are in addition to the lists published monthly, beginning with the September, 1942, *Bulletin*, with the exception of the June, 1943, issue.

★ LETTERS FROM SERVICEMEN ★

New York, N. Y.,
17 March, 1945

Dear Sirs:

Owing to the time involved (approximately three months) for correspondence to make a complete circuit, I suggest that you do not mail any of the usual data to me. An example is the current ballot for the officers of The Society which I received yesterday, also the date of final submittal.

My mode of living is such that I carry all my possessions on my back and some of these Italian mountains seem rather rough and high. Please continue to send the publications to my Lewistown, Mont., address.

Sincerely,
JACK PITTMAN,
Private, U. S. Army

★

Somewhere in France,
6 March, 1945

Dear Sirs:

I realize very much that I've fallen down in my duties to The Society, and about the only excuse I have is that the Army has kept me very busy in the past few months. I am enclosing a $10 money order and a request for the balance of my dues.

What I am interested in is some information and advice from The Society. I received my degree in ceramic engineering at Georgia Tech in February, 1943, and went immediately into the Army. I feel that after the war I would like to take a short refresher course before entering the field. My big question is—has The American Ceramic Society any setup for aiding returning servicemen in finding positions in the ceramic field? I would certainly appreciate any help and information you could give me on this matter.

I wonder if you have any word on the whereabouts of Professor Wysong or Dr. Lane Mitchell, both professors of ceramics at Georgia Tech who joined the Navy in late 1942.

Sincerely yours,
HARVEY L. COHEN,
U. S. Army

★

New York, N. Y.,
12 March, 1945

To all you "Mud-Slingers":

Just received your Christmas Greeting. Thanks so much. Can't wait to get back with the ceramic industry again.

Best regards,
JOHN H. KOLSTAD,
Sergeant, U. S. Army

★

New York, N. Y.,
12 March, 1945

Dear Ross:

I have received your and The Society's letters for some time without dropping a note of appreciation for your interest. I have found that they are very, very welcome in my new life that was adopted for me back in 1943.

I cannot divulge my whereabouts over here so must disappoint you there, but it is in France. I have seen much evidence of the ceramic industry here, about nine-tenths of it scattered over the ground, especially tile, glass, and other related products. I hope the day soon comes when we can all pitch in and get that tile and glass throughout the world back in its proper place again.

Your meeting in Buffalo, the 47th Annual Meeting, sounds like a dream to me. How I wish I could attend it and sit around rubbing elbows with Bob Sherwood and the gang again. I'll reserve a thought for you all on the days 15th to 18th of April, however, and make a wish that in 1946 I'll see my dream come true of actually being at the 48th Annual Meeting.

V-mails are small, so I'll close with best personal regards to you and my friends in The Society.

Sincerely,
A. RUSSELL ARNOLD,
Corporal, U. S. Army

★

Des Moines, Iowa,
10 March, 1945

Dear Ross Purdy:

This letter is to tell you that I will not be actively engaged in ceramic work until the end of this emergency.

I wish to end my membership temporarily. I would have written sooner but this new life does not permit much free time at first.

My interest will never end because I intend to make ceramics my future life.

My fiancé, Abbott Pozefsky, is taking *The Bulletin* and *Journal* for both of us.

The monthly letter you send to servicemen will be a welcome letter.

I am sorry to hear of the ODT's order to prevent large meetings, but I'm sure The American Ceramic Society will carry on as best it can.

During the luncheon at last year's Meeting, you said that you would help us get married at this year's Meeting. Maybe in a few years the Meeting and marriage will be held. You were very nice to us and it will not be forgotten.

Yours for Victory,
JEWEL KARPEL,
Private, Women's Army Corps

★

China,
28 March, 1945

Dear Dr. Purdy:

The Society's 3 March letter reached me today. This time I am writing to tell you that I've received the letters for some time and appreciate them very much.

Last spring, I had high hopes of seeing some Chinese pottery in process, but so far I'm not learning anything except how not to be a ceramist from them. I have been entirely away from the industry for three years and at present am a weather forecaster, but hope to return to the work in another year or so. I'll be interested in a college refresher course also when I return.

In the meantime, my wife is developing a hobby of art pottery, so she will be with me at the first Society Meeting after the war.

Sincerely,
GEORGE A. CLEEVES,
First Lieutenant, Army Air Corps

★

Tampa, Fla.,
9 April, 1945

Dear Dr. Purdy:

I have received and read with interest all your letters and publications from The Society. I wish to thank you for the interesting news and remembering the servicemen who are so far from the industry. I, for one, have been in the States for three years and have had the opportunity to make the necessary contacts and "keeping-up" of my profession. After leaving Virginia Polytechnic Institute, I worked on the research development of radar insulators before enlisting, and that time plus the service time has brought to my attention the postwar demands for greater technological developments. I plan to finish my master's degree as soon as my tour of duty is terminated and I am looking with interest and, of course, security toward many possibilities for a thesis.

Thanking you for your continual news of the industry, I remain

Very truly yours,
CHARLES E. BUTLER,
Private First Class, Army Air Corps

PERSONAL NOTES

PERRY D. HELSER*

Executive Assistant to the President
Gladding, McBean & Co.

Perry D. Helser was chief of the Magnesium Branch of the War Production Board from November, 1941, to July, 1944, and was Secretary-Director of the Magnesium Association from July, 1944, until his acceptance of this connection with Gladding, McBean & Co.

As Executive Assistant to the President, Fred B. Ortman, his duties, with top management functioning, will be varied. At present, he is in charge of the Company's research activities on existing products, exploration of possibilities of new products, and development and correlation of plans for plant improvements and extension.

Perry D. Helser has been engaged in research, plant operation, and executive management. He has been successful in enterprises that closely parallel those of Gladding, McBean & Co.

* For biographical sketch, see *Bull. Amer. Ceram. Soc.*, **19** [12] 479 (1940); see also *ibid.*, **23** [9] 333 (1944).

H. WHITTAKER

Assistant to President Charles J. Koebel, Koebel Diamond Tool Co., Detroit, Mich.

Design, Development, and Production of Diamond Tools

H. Whittaker received the degree of B.Sc. in Ceramics at the Pennsylvania State College in 1935. From 1935 to 1937, he was at the Massachusetts Institute of Technology, where he served as instructor in ceramics while working for his Doctor's degree, which degree was awarded *in absentia* in 1939.

It was in 1937 that Dr. Whittaker joined the Crane Company as research ceramist. When the United States entered the war, the Metallurgy Committee of the National Research Council asked Crane Company to make Dr. Whittaker available for work in industrial diamonds. For two and one-half years, he supervised industrial diamond projects out from the laboratories of the Crane Company, the Hoskins Manufacturing Company, and the National Bureau of Standards. He went with the Koebel Diamond Tool Company in January, 1945.

Dr. Whittaker was born in Oldham, England, June 20, 1902. His parents moved to Philadelphia, Pa., when he was two years of age. His preparatory schools were Northeast High and Brown Preparatory in Philadelphia.

Dr. Whittaker has been a member of this Society for the past ten years.

H. Whittaker

BATTELLE DIRECTOR RECEIVES DEGREE

Clyde E. Williams, director of Battelle Memorial Institute, Columbus, Ohio, was awarded an honorary Doctor of Science degree by the Case School of Applied Science, Cleveland, Ohio, at commencement exercises held April 22, 1945.

Mr. Williams has served as chairman of the War Metallurgy Committee of the National Academy of Sciences and the National Research Council. He is also serving as chief of the Metals Division of the National Defense Research Commission.

A detailed account of the work of the War Metallurgy Committee is given in the August, 1942, *Bulletin*, pp. 159–60. A biographical sketch and photograph of Mr. Williams also appear in the same issue.

L. A. MESSIMER WITH HOLOPHANE COMPANY

L. A. Messimer has accepted the position of glass technologist and assistant works manager with The Holophane Co., Newark, Ohio. Mr. Messimer, a ceramic engineer, has been a staff member of the Clay and Silicate Products Division, National Bureau of Standards, for the past fourteen years, his most recent assignment having been with the Optical Glass Section of the Bureau.

Mr. Messimer recently became a member of The American Ceramic Society.

EDWARD M. KOLB APPOINTED GENERAL SALES MANAGER

The American Potash & Chemical Corporation, New York, N. Y., has announced the appointment of Edward M. Kolb as general sales manager for the Company.

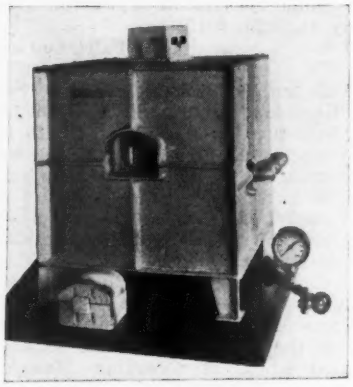
Mr. Kolb was assigned to the general sales office in New York in 1939 and in February, 1942, was named manager of potash sales, which position he has held to the present time (see *Bull. Amer. Ceram. Soc.*, **21** [4] 58 (1942)).

WANTED

Man fully qualified to take charge of glazing and decorating artware. Must have good working knowledge of glazes and colors. Plant located in northern New Jersey. State availability and salary desired. Address Box 280F, The American Ceramic Society, 2525 N. High St., Columbus 2, Ohio.

REMMEY LABORATORY KILN No. 2150

Write for Bulletin F-2



FEATURES

- May be Held at Any Temperature from 1200°F. to 3200°F.
- Single Valve Control
- Uniform Temperature
- No Stack Required
- Numerous Uses
- Two New Refractories Used
- Three Piece Lining
- High Thermal Efficiency
- Welded Steel Case
- Use either City, Natural or Propane Gas

Dependable Refractories

RICHARD C. REMMEY SON CO.

Hedley Street and Delaware Ave. PHILADELPHIA 37, PA.

BORAX *and* **BORIC ACID**

99½-100% PURE

NITRATE OF POTASH
CAUSTIC SODA
SULPHUR

Stauffer CHEMICALS SINCE 1885

STAUFFER CHEMICAL CO.

420 Lexington Avenue, New York, N. Y. 624 California Street, San Francisco, Cal.
444 Lake Shore Drive, Chicago, Illinois 550 South Flower Street, Los Angeles, Cal.

(1945)

TARIFFS AN IMPORTANT CONTRIBUTION IN THE DEVELOPMENT OF THE UNITED STATES

What do reductions of tariffs on imports mean to the American industries actually affected by them?

The handmade glassware industry is a good case in point. It is a handcraft industry in which the articles are produced chiefly by handwork, as pottery and china, toys, laces, and needlework and hats. A large aggregate number of Americans work in such industries. Labor costs are high; in handmade glassware they average at least 60% of the total production cost. Wages are high; in glassware again they are about four times greater on the average than those paid in the average foreign factory. For 155 years the United States has recognized this wage differential and, in an effort to equalize it, there constantly has been a United States tariff on imported handmade glassware.

That is the kernel of the tariff question for the handcraft industry. Yet, in discussion of tariffs and trade agreements, the handcraft industries seem to have been overlooked. Trade agreements tend to eliminate hand manufacturing industries because foreign manufacturers sell their low-priced hand labor products in direct competition with United States high wage scale hand labor products in the United States market.

Yet the tariff rates on handmade glassware imports have been reduced in four trade agreements, with Sweden, Czechoslovakia, Great Britain, and Mexico, since the Tariff Act of 1930, although the foreign handmade ware already sold for less than United States ware under the 1930 duties and imports had increased by 91% in handmade table and ornamental glassware and 251% in illuminating glassware in 1935–1937 without any trade agreement aid.

In 1937, before the war took effect, 22% of the handmade table glassware consumption in this country was supplied by imports. What will happen to the United States industry when imports return, at reduced tariff rates? Rates, by the way, figured at ad valorem on foreign value which is much lower than would be the value either at port of entry in the United States or a value based on United States production costs.

What will happen to the handmade glassware worker who loses his job because of import competition? It is erroneously stated that these workers will be employed in the machine industries; that has not happened in the past. Should it happen later, it means the end of an ancient, highly creative cultural craft in this country. It means the end of an extremely skilled craft which has been a great asset to this country during the war in providing large quantities of very specialized glass war matériel.

—*American Glassware Association*

TILE COUNCIL OF AMERICA

The Tile Council of America has been organized to direct a concerted drive to secure a larger share of the postwar building market for the wall- and floor-tile manufacturers of the United States. The Council was established in New York after a study of one year by a special advisory committee of the industry.

The chairman of the Council's advisory committee is Norris E. Phillips, vice-president and general manager, Olean Tile Co., Olean, N. Y. Other members are Roy E. Jordan, Jr., treasurer, Atlantic Tile Mfg. Co., Matawan, N. J.; Charles H. Burchenal, president, Cambridge Tile Mfg. Co., Cincinnati, Ohio; R. J. Schroeder, president and general manager, Pomona Tile Mfg. Co., Los Angeles, Calif.; D. P. Forst, president, Robertson Art Tile Co., Morrisville, Pa.; and D. A. Cable, president, United States Quarry Tile Co., East Sparta, Ohio.

Seventeen manufacturers of tile are associated in the work of the Council.

NECROLOGY

Gordon Campbell Keith

GORDON CAMPBELL KEITH

Gordon Campbell Keith, Secretary-Treasurer of the Canadian Ceramic Society for more than thirty years, died Tuesday April 24, 1945.

Mr. Keith was born at Smiths Falls, Ontario, Canada, October 5, 1879. He attended the public and high schools at Smiths Falls and in 1907 was graduated from Queen's University, Kingston, Ontario, in Mechanical and Civil Engineering with the degree of B.Sc.; he also completed a course in Geology and Mineralogy and was awarded one of the Engineering Society thesis prizes in his final year. He received the M.Sc. degree in 1911.

He was elected Life Member of the Stationary Engineers' Association in 1909. On December 22, 1910, he read an illustrated paper on "Modern Machine Tool Practice" at the Central Railway and Engineering Club, of which he was a member. In 1911, he was elected director of the Canadian National Clay Products Association, now known as the Canadian Ceramic Society. He was also appointed editor of *Canadian Manufacturer* and *The Canadian Clay-Worker* in 1911. He continued in this position until December, 1925.

Mr. Keith was elected secretary-treasurer of the Canadian National Clay Products Association in September, 1914, and was presented with a life membership in that Society in 1942 (see the December, 1942, *Bulletin*, p. 313).

In 1926, Mr. Keith organized his own company and edited and published *Clay Products News & Ceramic Record* and *Manufacturing & Industrial Engineering*. Later in the same year, he was elected secretary-treasurer of the Canadian Business Publishers Association.

Gordon Keith, a complimentary member of The American Ceramic Society since 1925, will be remembered as one of the genial hosts of The Society at the time of the Toronto Meeting in 1930 and again in 1940. The program issue of the latter Meeting was dedicated to Mr. Keith and contains a more complete biographical record than that given herein (see the April, 1940, *Bulletin*, pp. 153–54).

Frederic Addison Harvey

FREDERIC ADDISON HARVEY

Frederic Addison Harvey, director of research of the Harbison-Walker Refractories Co., Pittsburgh, Pa., and a Fellow of The American Ceramic Society, died April 27, 1945.

Dr. Harvey was born June 3, 1882, in Kellogg, Iowa. He received the B.S. degree from Grinnell College, Grinnell, Iowa, in 1904, the M.S. degree from the University of California in 1906, and the Ph.D. degree from the same university in 1909. He also attended the University of Goettingen, Germany, for one year.

During the years 1903 to 1916, he taught at Grinnell College, the University of California, and Syracuse University.

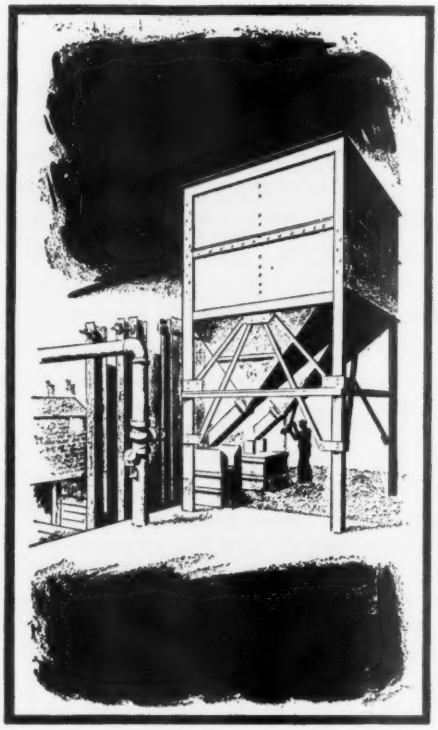
Before becoming associated with the Harbison-Walker Refractories Company in 1926, he worked for the Solvay Process Company, the Semet-Solvay Company, and the United States Refractories Company.

Dr. Harvey had been a member of The American Ceramic Society since 1918. He served as secretary of the Refractories Division in 1921–1923, chairman in 1924, and Trustee in 1928. In 1929, he served as vice-president of The Society.

He also had been a member of several other technical organizations, including the American Society for Testing Materials (Committee C–8 on Refractories), American Electrochemical Society, American Refractories Institute (Technical Advisory Committee), American Foundrymen's Association, and the Institute of Ceramic Engineers.

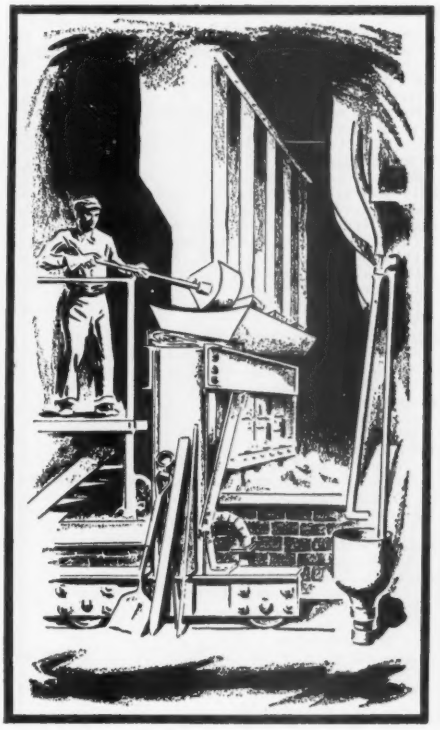
He was a member of Phi Beta Kappa and Sigma Xi.

Dr. Harvey had written many articles on refractories which had appeared in The Society and other publications.



DO NOT CHARGE THIS WAY

BUT



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ENGINEERS

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Carborundum Co. (*Carborundum and Aloxite*)
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Norton Co. (*Alundum-Crystolon*)

Acid-proof Mortars
Corhart Refractories Co.

Air Conditioning Systems
Frazier-Simplex, Inc.

Aloxite (Refractory Products)
Carborundum Co.

Alumina (Hydrate and Calcined)
Drakenfeld, B. F., & Co., Inc.
Du Pont de Nemours E. I., & Co., Inc.
Harshaw Chemical Co.
Hommel, O., Co., Inc.
Pennsylvania Salt Mfg. Co.
Vitro Mfg. Co.

Alumina (Fused) Brick and Tile
Electro Refractories & Alloys Corp.
Remmey, Richard C., Son Co.
Vitro Mfg. Co.

Aluminum Oxide (Calcine)
Hommel, O., Co., Inc.
Vitro Mfg. Co.

Aluminum Oxide (Fused)
Carborundum Co.
Electro Refractories & Alloys Corp.
Foote Mineral Co.
Norton Co.
Vitro Mfg. Co.

Alundum (Refractory Products)
Norton Co.

Ammonium Bicarbonate
Du Pont de Nemours, E. I., & Co., Inc.
Hommel. O., Co., Inc.
Solvay Sales Corp.

Ammonium Bifluoride
Drakenfeld, B. F., & Co., Inc.
Du Pont de Nemours, E. I., & Co., Inc.
Harshaw Chemical Co.
Hommel, O., Co., Inc.
Innis, Speiden & Co.
Vitro Mfg. Co.

Ammonium Carbonate
Drakenfeld, B. F., & Co., Inc.
Du Pont de Nemours, E. I., & Co., Inc.
Harshaw Chemical Co.
Hommel, O., Co., Inc.
Vitro Mfg. Co.

Antimony Oxide
Drakenfeld, B. F., & Co., Inc.
Harshaw Chemical Co.
Hommel, O., Co., Inc.
Metal & Thermit Corp.
Vitro Mfg. Co.

Antimony Sulphide
Foote Mineral Co.
Harshaw Chemical Co.
Hommel, O., Co., Inc.

Arches (Interlocking, Suspended, and Circular)
Frazier-Simplex, Inc.

Arsenic
Drakenfeld, B. F., & Co., Inc.
Harshaw Chemical Co.
Hommel, O., Co., Inc.

Automatic Brick Car Loaders
Lancaster Iron Works, Inc.

Ball Mills
Drakenfeld, B. F., & Co., Inc.
Hommel, O., Co., Inc.
McDanel Refractory Porcelain Co.
Vitro Mfg. Co.

Ball Mills (Laboratory Type)
Drakenfeld, B. F., & Co., Inc.
Hommel, O., Co., Inc.
Vitro Mfg. Co.

Barium Carbonate
Drakenfeld, B. F., & Co., Inc.
Du Pont de Nemours, E. I., & Co., Inc.
Foote Mineral Co.
Hammill & Gillespie, Inc.
Harshaw Chemical Co.
Hommel, O., Co., Inc.
Vitro Mfg. Co.

Barytes
Clinchfield Sand & Feldspar Corp.
Harshaw Chemical Co.

Basic Oxides
Drakenfeld, B. F., & Co., Inc.
Ferro Enamel Corp.
Harshaw Chemical Co.
Hommel, O., Co., Inc.
Pemco Corp.

Batch Systems & Chargers
Frazier-Simplex, Inc.

Batts
Carborundum Co. ("*Carbofrax Aloxite*")
Electro Refractories & Alloys Corp.
Norton Co. (*Alundum-Crystolon*)
Remmey, Richard C., Son Co.

Bentonite
Great Lakes Foundry Sand Co.
Hammill & Gillespie, Inc.
Harshaw Chemical Co.
Hommel, O., Co., Inc.

Beryl
Foote Mineral Co.

Bichromate of Soda
Harshaw Chemical Co.
Hommel, O., Co., Inc.

Bitstone
Potters Supply Co.

Blocks (Refractory)
Carborundum Co.
Corhart Refractories Co.
Electro Refractories & Alloys Corp.
Norton Co.
Remmey, Richard C., Son Co.
Vitro Mfg. Co.

Blowers
Robinson Ventilating Co.

Body Stains
Drakenfeld, B. F., & Co., Inc.
Du Pont de Nemours, E. I., & Co., Inc.
Ferro Enamel Corp.
Harshaw Chemical Co.
Hommel, O., Co., Inc.
Maxson, Elwyn L.
Pemco Corp.

Bone Ash
Drakenfeld, B. F., & Co., Inc.
Harshaw Chemical Co.
Hommel, O., Co., Inc.

Borax
American Potash & Chemical Corp.
Drakenfeld, B. F., & Co., Inc.
Du Pont de Nemours, E. I., & Co., Inc.
Harshaw Chemical Co.
Hommel, O., Co., Inc.
Innis, Speiden & Co.
Pacific Coast Borax Co.
Pemco Corp.
Stauffer Chemical Co.
Vitro Mfg. Co.

Borax Glass
Drakenfeld, B. F., & Co., Inc.
Du Pont de Nemours, E. I., & Co., Inc.
Harshaw Chemical Co.
Hommel, O., Co., Inc.
Pacific Coast Borax Co.
Stauffer Chemical Co.
Vitro Mfg. Co.

Boric Acid (Anhydrous)
Drakenfeld, B. F., & Co., Inc.
Harshaw Chemical Co.
Hommel, O., Co., Inc.
Pacific Coast Borax Co.
Stauffer Chemical Co.
Vitro Mfg. Co.

Boric Acid (Crystal, Granular, or Powder)
American Potash & Chemical Corp.
Drakenfeld, B. F., & Co., Inc.
Harshaw Chemical Co.
Hommel, O., Co., Inc.
Innis, Speiden & Co.
Pacific Coast Borax Co.
Stauffer Chemical Co.
Vitro Mfg. Co.

Boron Carbide
Norton Co.

Brick Machines (also Barrows, Molds)
Lancaster Iron Works, Inc.

Brick (Refractory)
Carborundum Co. ("*Carbofrax Aloxite*")
Corhart Refractories Co.
Electro Refractories & Alloys Corp.
Norton Co.
Remmey, Richard C., Son Co.
Vitro Mfg. Co.

Cadmium Oxide
Drakenfeld, B. F., & Co., Inc.

Cadmium Sulphide
Drakenfeld, B. F., & Co., Inc.
Du Pont, de Nemours and Co., Inc., Electrochemicals Dept.
Ferro Enamel Corp.
Harshaw Chemical Co.
Hommel, O., Co., Inc.

Carbofrax (Refractory Products)
Carborundum Co.

Carbonates (Barium, Lead)
Drakenfeld, B. F., & Co., Inc.
Du Pont de Nemours, E. I., & Co., Inc.
Foote Mineral Co.
Harshaw Chemical Co.
Hommel, O., Co., Inc.
Vitro Mfg. Co.

Castings
Lancaster Iron Works, Inc.

Caustic Potash
Du Pont de Nemours, E. I., & Co., Inc.
Harshaw Chemical Co.
Hommel, O., Co., Inc.
Solvay Sales Corp.

Caustic Soda
Du Pont de Nemours, E. I., & Co., Inc.
Harshaw Chemical Co.
Hommel, O., Co., Inc.
Pennsylvania Salt Mfg. Co.
Solvay Sales Corp.
Stauffer Chemical Co.
Vitro Mfg. Co.

Cements
Bausch & Lomb Optical Co.
Carborundum Co.
Corhart Refractories Co.
Electro Refractories & Alloys Co.
Norton Co.
Pennsylvania Salt Mfg. Co.
Remmey, Richard C., Son Co.

Ceramic Chemicals
Drakenfeld, B. F., & Co., Inc.
Du Pont de Nemours, E. I., & Co., Inc., Electrochemicals Dept.
Ferro Enamel Corp.
Harshaw Chemical Co.
Hommel, O., Co., Inc.
Metal & Thermit Corp.
Pemco Corp.
Pennsylvania Salt Mfg. Co.
Titanium Alloy & Mfg. Co.
Vitro Mfg. Co.

Cerium Oxide
Drakenfeld, B. F., & Co., Inc.
Foote Mineral Co.
Harshaw Chemical Co.
Hommel, O., Co., Inc.

Chromite (Natural Chromate of Iron)
Foote Mineral Co.
Hommel, O., Co., Inc.

Chromium Oxide
Drakenfeld, B. F., & Co., Inc.
Du Pont de Nemours, E. I., & Co., Inc. Electrochemicals Dept.
Ferro Enamel Corp.
Hommel, O., Co., Inc.
Pemco Corp.
Vitro Mfg. Co.

Clay (Ball)
Hammill & Gillespie, Inc.
Harshaw Chemical Co.
Hommel, O., Co., Inc.
Kentucky Clay Mining Co.
Maxson, Elwyn L.
Potters Supply Co.
Spinks, H. C., Clay Co.
Vitro Mfg. Co.

Clay (China)
Hammill & Gillespie, Inc.
Harshaw Chemical Co.
Hommel, O., Co., Inc.
Maxson, Elwyn L.
Vitro Mfg. Co.

Clay—Cleaners, Feeders
Lancaster Iron Works, Inc.

Clay (Electrical Porcelain)
Hammill & Gillespie, Inc.
Hommel, O., Co., Inc.
Kentucky Clay Mining Co.
Maxson, Elwyn L.
Spinks, H. C., Clay Co.

Clay (Enamel)
Ferro Enamel Corp.
Hammill & Gillespie, Inc.
Harshaw Chemical Co.
Hommel, O., Co., Inc.
Kentucky Clay Mining Corp.
Maxson, Elwyn L.
Metal & Thermit Corp.
Pemco Corp.
Spinks, H. C., Clay Co.
Titanium Alloy & Mfg. Co.
Vitro Mfg. Co.

Clay (Fire)
Great Lakes Foundry Sand Co.
Maxson, Elwyn L.
Potters Supply Co.

Clay (Micronized)
Pemco Corp.

Clay Miners
Great Lakes Foundry Sand Co.
Kentucky Clay Mining Co.
Maxson, Elwyn L.
Spinks, H. C., Clay Co.

Clay (Modeling)
Potters Supply Co.

Clay (Potters)
Hammill & Gillespie, Inc.
Hommel, O., Co., Inc.
Kentucky Clay Mining Co.
Maxson, Elwyn L.
Spinks, H. C., Clay Co.

Clay (Process Equipment)
Lancaster Iron Works, Inc.

Clay (Sagger)
Georgia Kaolin Co.
Great Lakes Foundry Sand Co.
Hommel, O., Co., Inc.
Kentucky Clay Mining Co.
Maxson, Elwyn L.
Spinks, H. C., Clay Co.

Clay-Slip (Albany)
Hammill & Gillespie, Inc.
Hommel O., Co., Inc.
Maxson, Elwyn L.

Clay (Wad)
Kentucky Clay Mining Co.
Spinks, H. C., Clay Co.

Clay (Wall Tile)
Hammill & Gillespie, Inc.

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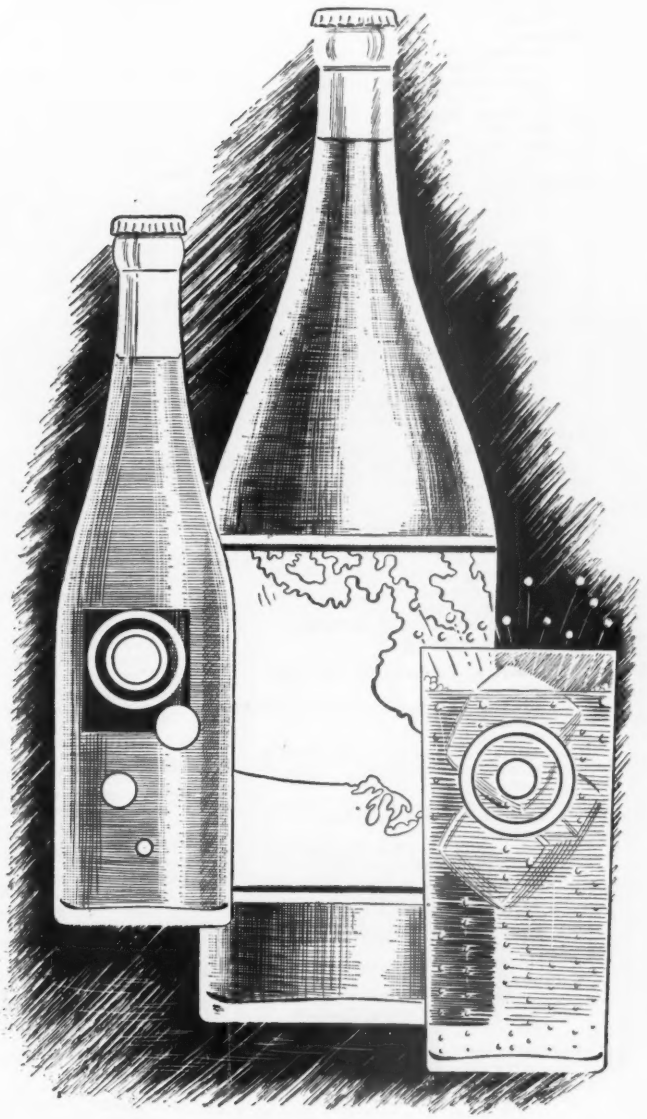

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Maxson, Elwyn L.
Spinks, H. C., Clay Co.

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Pemco Corp.
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Solvay Sales Corp.

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CO_2 Recorders
Leeds & Northrup Co.

Cobalt, Oxide
Drakenfeld, B. F., & Co., Inc.
Du Pont de Nemours, E. I., & Co., Inc., Electrochemicals Dept.
Ferro Enamel Corp.
Harshaw Chemical Co.
Hommel, O., Co., Inc.
Pemco Corp.
Vitro Mfg. Co.

Cobalt Sulphate
Drakenfeld, B. F., & Co., Inc.
Du Pont, de Nemours, E. I., & Co., Inc. Electrochemicals Dept.
Ferro Enamel Corp.
Harshaw Chemical Co.
Hommel, O., Co., Inc.

Colors
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Du Pont de Nemours, E. I., & Co., Inc., Electrochemicals Dept.
Ferro Enamel Corp.
Harshaw Chemical Co.
Hommel, O., Co., Inc.
Maxson, Elwyn L.
Pemco Corp.
Vitro Mfg. Co.

Combustion Control
Leeds & Northrup Co.

Combustion Meters (CO_2 Recorders)
Leeds & Northrup Co.

Cone Plaques
Industrial Ceramic Products, Inc.

Cones
Edward Orton, Jr., Ceramic Foundation
Maxson, Elwyn L.

Controllers—Automatic Tank Pressure
Leeds & Northrup Co.

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Lancaster Iron Works, Inc.

Copper Oxide
Drakenfeld, B. F., & Co., Inc.
Harshaw Chemical Co.
Hommel, O., Co., Inc.

Cornwall Stone (Imported)
Drakenfeld, B. F., & Co., Inc.
Hammill & Gillespie, Inc.
Hommel, O., Co., Inc.
Maxson, Elwyn L.

Corundum Refractories
Corhart Refractories Co.

Crucibles (Filter, Melting, Ignition)
Norton Co.

Crushers (Clay)
Lancaster Iron Works, Inc.

Cryolite (see Kryolith)
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Du Pont de Nemours, E. I., & Co., Inc.
Harshaw Chemical Co.
Pennsylvania Salt Mfg. Co.
Vitro Mfg. Co.

Crystolon (Refractory Products)
Norton Co.

Cullet, Washing Plants, Incinerators, Crushers
Frazier-Simplex, Inc.

Cutters (Bar)
Industrial Ceramic Products, Inc.

Decalcomania
Commercial Decal, Inc.

Decorating Supplies
Commercial Decal, Inc.
Drakenfeld, B. F., & Co., Inc.
Du Pont de Nemours, E. I., & Co., Inc., Electro chemicals Dept.
Ferro Enamel Corp.
Harshaw Chemical Co.
Hommel, O., Co., Inc.
Vitro Mfg. Co.

Disintegrators
Lancaster Iron Works, Inc.

Dryer (Pipe Rack)
Lancaster Iron Works, Inc.

Dryers (Waste Heat, Continuous and Batch Type)
Harrop Ceramic Service Co.

Drying Machinery
Frazier-Simplex, Inc.
Lancaster Works, Inc.

Electrocast Refractories
Corhart Refractories Co.

Enameling Equipment (Complete)
Ferro Enamel Corp.
Hommel, O., Co., Inc.
Vitro Mfg. Co.

Enameling Furnaces
Carborundum Co.
Ferro Enamel Corp.
Hommel, O., Co., Inc.
Norton Co.

Enameling Iron (Sheet)
American Rolling Mill Co.

Enameling Muffles
Carborundum Co. (*Carbofrax*)
Maxson, Elwyn L.
Norton Co. (*Alundum*)

Enameling (Practical Service)
Ferro Enamel Corp.
Harshaw Chemical Co.
Hommel, O., Co., Inc.
Metal & Thermit Corp.
Pemco Corp.
Titanium Alloy & Mfg. Co.
Vitro Mfg. Co.

Enamels
Drakenfeld, B. F., & Co., Inc.
Du Pont de Nemours, E. I., & Co., Inc., Electrochemicals Dept.
Ferro Enamel Corp.
Harshaw Chemical Co.
Hommel, O., Co., Inc.
Maxson, Elwyn L.
Pemco Corp.
Vitro Mfg. Co.

Enamel Oxide
Drakenfeld, B. F., & Co., Inc.
Du Pont de Nemours, E. I., & Co., Inc., Electrochemicals Dept.
Ferro Enamel Corp.
Harshaw Chemical Co.
Hommel, O., Co., Inc.

Enamels (Porcelain)
Ferro Enamel Corp.
Harshaw Chemical Co.
Hommel, O., Co., Inc.
Pemco Corp.
Titanium Alloy & Mfg. Co.
Vitro Mfg. Co.

Engineering Service
Ferro Enamel Corp.
Frazier-Simplex, Inc.
Harrop Ceramic Service Co.

Epsom Salts
Innis, Speiden & Co.

Equipment (Porcelain Enameling)
Ferro Enamel Corp.
Hommel, O., Co., Inc.

Fans
Robinson Ventilating Co.

Feldspar
Clinchfield Sand & Feldspar Corp.
Du Pont de Nemours, E. I., & Co., Inc., Electrochemicals Dept.
Harshaw Chemical Co.
Hommel, O., Co., Inc.
Maxson, Elwyn L.
Pemco Corp.
Solvay Sales Corp.
Vitro Mfg. Co.

Filter Fabrics
Metakloth Company

Fire Brick
Carborundum Co.
Corhart Refractories Co.
Electro Refractories & Alloys Corp.
Norton Co.
Remmey, Richard C., Son Co.

Fire Brick—Process Equipment
Lancaster Iron Works, Inc.

Fire Clay
Great Lakes Foundry Sand Co.
Spinks, H. C., Clay Co.

Flint
Clinchfield Sand & Feldspar Corp.
Du Pont de Nemours, E. I., & Co., Inc.
Great Lakes Foundry Sand Co.
Harshaw Chemical Co.
Hommel, O., Co., Inc.
Maxson, Elwyn L.
Pemco Corp.

Flint Pebbles
Clinchfield Sand & Feldspar Corp.
Hommel, O., Co., Inc.
Maxson, Elwyn L.
Vitro Mfg. Co.

Flint (Soft decomposed Cararra)
Innis, Speiden & Co.

Floating Construction for Tunnel Kiln Cars
Electro Refractories and Alloys Corp.

Floors (Non-Slip)
Norton Co.

Fluorspar
Harshaw Chemical Co
Hommel, O., Co., Inc.

French Flint
Maxson, Elwyn L.

Frit
Ferro Enamel Corp.
Harshaw Chemical Co.
Hommel, O., Co., Inc.
Maxson, Elwyn L.
Pemco Corp.
Titanium Alloy & Mfg. Co.
Vitro Mfg. Co.

Frosting Mixtures
Drakenfeld, B. F., & Co., Inc.
Harshaw Chemical Co.
Hommel, O., Co., Inc.

Fuel Oil Systems and Control Stokers
Frazier-Simplex, Inc.
Harrop Ceramic Service Co.

Furnaces
Carborundum Co. (*Carboradiant*)
Ferro Enamel Corp.
Frazier-Simplex, Inc.
Harrop Ceramic Service Co.
Hommel, O., Co., Inc.
Swindell-Dressler Corp.

Furnaces (Laboratory)
Remmey, Richard C., Son Co.

Furnaces, Enameling
Ferro Enamel Corp.
Swindell-Dressler Corp.

Gauges, Draft (Recording, Indicating)
Leeds & Northrup Co.

Gauges, Pressure
Leeds & Northrup Co.

Glass Bending Ovens, Glass Decorating Machines
Frazier-Simplex, Inc.

Glass Equipment (Batch Mixer)
Lancaster Iron Works, Inc.

Glass Furnace Refractories
Corhart Refractories Co.

Glass Melting Tanks and Furnaces
Frazier-Simplex, Inc.

Glass Sand
Great Lakes Foundry Sand Co.

Glass Thickness Gauge
Bausch & Lomb Optical Co.

Glaze and Body Spar
Clinchfield Sand & Feldspar Corp.
Du Pont de Nemours, E. I., & Co., Inc., Electrochemicals Dept.
Harshaw Chemical Co.
Hommel, O., Co., Inc.
Maxson, Elwyn L.
Pemco Corp.
Vitro Mfg. Co.

Glazes and Enamels
Drakenfeld, B. F., & Co., Inc.
Du Pont de Nemours, E. I., & Co., Inc., Electrochemicals Dept.
Ferro Enamel Corp.
Harshaw Chemical Co.
Hommel, O., Co., Inc.
Maxson, Elwyn L.
Pemco Corp.
Titanium Alloy & Mfg. Co.
Vitro Mfg. Co.

Glaze Spar
Clinchfield Sand & Feldspar Corp.
Du Pont de Nemours, E. I., & Co., Inc., Electrochemicals Dept.
Harshaw Chemical Co.
Hommel, O., Co., Inc.
Maxson, Elwyn L.

Goggles
Bausch & Lomb Optical Co.
Hommel, O., Co., Inc.

Gold
Drakenfeld, B. F., & Co., Inc.
Du Pont de Nemours, E. I., & Co., Inc., Electrochemicals Dept.
Harshaw Chemical Co.
Hommel, O., Co., Inc.
Vitro Mfg. Co.

Gold Decorations
Du Pont de Nemours, E. I., & Co., Inc., Electrochemicals Dept.
Harshaw Chemical Co.
Hommel, O., Co., Inc.

Granulators
Lancaster Iron Works, Inc.

Grinding Wheels
Carborundum Co. (*Carborundum and Aloxite*)
Electro Refractories & Alloys Corp.
Norton Co. (*Alundum-Crystolon*)

Gums: *Arabic*—Amber Sorts, Powdered Grained
Ghatti—Powdered, Granular, Crude
Locust Bean—Powdered
Tragacanth—Ribbon—Flake—Powdered
Innis, Speiden & Co.

Hearths
Carborundum Co. (*Carbofrax* heat treating)
Corhart Refractories Co.
Norton Co. (*Crystolon*)
Remmey, Richard C., Son Co.

Hearths (High Aluminous Clay, Electrically Sintered Aluminum Oxide, Silicon Carbide)
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Norton Co.
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Hommel, O., Co., Inc.
Pennsylvania Salt Mfg. Co.
Ilmenite
Foote Mineral Co.
Orefraction, Inc.
Iron (Enameling)
American Rolling Mill Co.
Iron Oxide
Drakenfeld, B. F., & Co., Inc.
Du Pont de Nemours, E. I., & Co., Inc.
Foote Mineral Co.
Harshaw Chemical Co.
Hommel, O., Co., Inc.
Pemco Corp.
Vitro Mfg. Co.
Kaolin
Hammill & Gillespie, Inc.
Harshaw Chemical Co.
Hommel, O., Co., Inc.
Maxson, Elwyn L.
Vitro Mfg. Co.
Kiln Furniture (Silicon Carbide, Semi-Silicon Carbide) (Refractory)
Carborundum Co.
Electro Refractories & Alloys Corp.
Ferro Enamel Corp.—Ceramic Supply Div.
Maxson, Elwyn L.
Remmey, Richard C., Son Co.
Kilns, China (Decorating)
Drakenfeld, B. F., & Co., Inc.
Ferro Enamel Corp.—Allied Engineering Div.
Frazier-Simplex, Inc.
Harrop Ceramic Service Co.
Hommel, O., Co., Inc.
Swindell-Dressler Corp.
Kilns (Electric, Circular, Tunnel)
Ferro Enamel Corp.—Allied Engineering Div.
Harrop Ceramic Service Co.
Maxson, Elwyn L.
Swindell-Dressler Corp.
Kilns (Laboratory)
Remmey, Richard C., Son Co.
Kryolith (see Cryolite)
Pennsylvania Salt Mfg. Co.
Laboratory Ware
Norton Co.
Lehr Tile (High Aluminous Clay, Electrically Sintered Aluminum Oxide, Silicon Carbide)
Carborundum Co.
Electro Refractories & Alloys Corp.
Lehrs
Frazier-Simplex, Inc.
Swindell-Dressler Corp.
Lehrs (Electric or Fuel Heated)
Frazier-Simplex, Inc.
Swindell-Dressler Corp.
Lehr Loaders
Frazier-Simplex, Inc.
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Carborundum Co.
Corhart Refractories Co.
Electro Refractories & Alloys Corp.
Maxson, Elwyn L.
Norton Co.
Remmey, Richard C., Son Co.
Vitro Mfg. Co.
Lithium Carbonate
Drakenfeld, B. F., & Co., Inc.
Foote Mineral Co.
Hommel, O., Co., Inc.
Metalloy Corp.
Lithium Minerals
Foote Mineral Co.
Metalloy Corp.
Magnesia (Fused)
Electro Refractories & Alloys Corp.
Norton Co.
Magnesia (Sintered,Calcined)
Drakenfeld, B. F., & Co., Inc.
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Hommel, O., Co., Inc.
Pemco Corp.
Magnesite
Drakenfeld, B. F., & Co., Inc.
Du Pont de Nemours, E. I., & Co., Inc.
Foote Mineral Co.
Hammill & Gillespie, Inc.
Harshaw Chemical Co.
Hommel, O., Co., Inc.
Vitro Mfg. Co.
Magnesite Calcined
Foote Mineral Co.
Harshaw Chemical Co.
Hommel, O., Co., Inc.
Magnesium Carbonate
Drakenfeld, B. F., & Co., Inc.
Ferro Enamel Corp.
Harshaw Chemical Co.
Hommel, O., Co., Inc.
Manganese Dioxide
Drakenfeld, B. F., & Co.
Ferro Enamel Corp.
Foote Mineral Co.
Hammill& Gillespie, Inc.
Harshaw Chemical Co.
Hommel, O., Co., Inc.
Vitro Mfg. Co.
Manganese (Oxide)
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Drakenfeld, B. F., & Co., Inc.
Ferro Enamel Corp.
Harshaw Chemical Co.
Hommel, O., Co., Inc.
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Hommel, O., Co., Inc.
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Bausch & Lomb Optical Co.
Harshaw Chemical Co.
Spencer Lens Co.
Microscopes (Stereoscopic)
Bausch & Lomb Optical Co.
Harshaw Chemical Co.
Spencer Lens Co.
Minerals
Clinchfield Sand & Feldspar Corp.
Drakenfeld, B. F., & Co., Inc.
Du Pont de Nemours, E. I., & Co., Inc., Electrochemicals Dept.
Foote Mineral Co.
Hammill & Gillespie, Inc.
Harshaw Chemical Co.
Hommel, O., Co., Inc.
Orefraction, Inc.
Vitro Mfg. Co.
Mixers
Clearfield Machine Co.
Mixers (Batch)
Clearfield Machine Co.
Lancaster Iron Works, Inc.
Mixers (Concrete, Paving, Road Paving, Plaster, Asphalt, Truck, Mortar, Bituminous)
Lancaster Iron Works, Inc.
Mixers (Laboratory)
Lancaster Iron Works, Inc.
Mold Sanders
Lancaster Iron Works, Inc.
Muffles (Furnace) (Laboratory)
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Maxson, Elwyn L.
Norton Co.
Remmey, Richard C., Son Co.
Mullers (Batch)
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Lancaster Iron Works, Inc.
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Corhart Refractories Co.
Remmey, Richard C., Son Co.
Muriatic Acid
Harshaw Chemical Co.
Hommel, O., Co., Inc.
Pennsylvania Salt Mfg. Co.
Needle Antimony
Foote Mineral Co.
Harshaw Chemical Co.
Hommel, O., Co., Inc.
Nepheline Syenite
Great Lakes Foundry Sand Co.
Maxson, Elwyn L.
Nickel Salts
Drakenfeld, B. F., & Co., Inc.
Harshaw Chemical Co.
Hommel, O., Co., Inc.
Nitrates (Cobalt, Sodium)
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Du Pont de Nemours, E. I., & Co., Inc.
Harshaw Chemical Co.
Hommel, O., Co., Inc.
Vitro Mfg. Co.
Nitre
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Hommel, O., Co., Inc.
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Norton Co.
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Pemco Corp.
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Vitro Mfg. Co.
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Harshaw Chemical Co.
Hommel, O., Co., Inc.
Maxson, Elwyn L.
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Ferro Enamel Corp.
Harshaw Chemical Co.
Hommel, O., Co., Inc.
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Metal & Thermit Corp.
Pemco Corp.
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Vitro Mfg. Co.
Palladium Decorations
Du Pont de Nemours, E. I., & Co., Inc., Electrochemicals Dept.
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Industrial Ceramic Products, Inc.
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Vitro Mfg. Co.
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Ferro Enamel Corp.
Harshaw Chemical Co.
Hommel, O., Co., Inc.
Pemco Corp.
Titanium Alloy & Mfg. Co.
Vitro Mfg. Co.
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Hommel, O., Co.,Inc.
Innis, Speiden & Co.
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Leeds & Northrup Co.
Maxson, Elwyn L.
Montgomery Porcelain Products Co.
Pyrometer Tubes (Refractory and Hard Porcelain)
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Montgomery Porcelain Products Co.
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Maxson, Elwyn L.
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Vitro Mfg. Co.
Saggers
Carborundum Co.
Electro Refractories & Alloys Corp.
Ferro Enamel Corp.—Ceramic Supply Div.
Maxson, Elwyn L.
Norton Co.
Potters Supply Co.
Remmey, Richard C., Son Co.
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Pennsylvania Salt Mfg. Co.
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Clipper Mfg. Co.
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Hommel, O., Co., Inc.
Vitro Mfg. Co.
Selenium
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Harshaw Chemical Co.
Hommel, O., Co., Inc.
Vitro Mfg. Co.
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Electro Refractories & Alloys Corp.
Foote Mineral Co.
Hommel, O., Co., Inc.
Remmey, Richard C., Son Co.
Silicate Furnace Refractories
Corhart Refractories Co.
Silicate of Soda
Harshaw Chemical Co.
Hommel, O., Co., Inc.
Silicon Carbide
Carborundum Co.
Electro Refractories & Alloys Corp.
Norton Co.
Sillimanite Refractories
Electro Refractories & Alloys Corp.
Maxson, Elwyn L.
Remmey, Richard C., Son Co.
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Vitro Mfg. Co.
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Sodium Orthosilicate
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Maxson, Elwyn L.
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Potters Supply Co.
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Pennsylvania Salt Mfg. Co.
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Stauffer Chemical Co.
Sulfuric Acid
Harshaw Chemical Co.
Hommel, O., Co., Inc.
Pennsylvania Salt Mfg. Co.
Stauffer Chemical Co.
Talc (Lava)
Clinchfield Sand & Feldspar Corp.
Maxson, Elwyn L.
Talcs
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Hammill & Gillespie, Inc.
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Innis, Speiden & Co.
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Tank Blocks
Corhart Refractories Co.
Tanks (Pickle)
Hommel, O., Co., Inc.
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Tile (Floor)
Carborundum Co.
Norton Co.
Tile (Muffle)
Carborundum Co.
Electro Refractories & Alloys Corp.
Norton Co.
Remmey, Richard C., Son Co.
Tile (Refractory)
Carborundum Co., (*Carbofrax*)
Electro Refractories & Alloys Corp.
Norton Co
Remmey, Richard C., Son Co.
Tin Oxide
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Du Pont de Nemours, E. I., & Co., Inc., Electrochemicals Dept.
Hommel, O., Co., Inc.
Metal & Thermit Corp.
Vitro Mfg. Co.
Titanium Oxide
Drakenfeld, B. F., & Co., Inc.
Du Pont de Nemours, E. I., & Co., Inc.
Foote Mineral Co.
Harshaw Chemical Co.
Hommel, O., Co., Inc.
Metal & Thermit Corp.
Orefraction, Inc.
Titanium Alloy Mfg. Co.
Vitro Mfg. Co.
Trisodium Phosphate
Harshaw Chemical Co.
Hommel, O., Co., Inc.
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McDanel Refractory Porcelain Co.
Norton Co.
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Carborundum Co.
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Leeds & Northrup Co.
Maxson, Elwyn L.
McDanel Refractory Porcelain Co.
Montgomery Porcelain Products Co.
Norton Co.
Ultrox
Metal & Thermit Corp.
Uranium Oxide
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Ferro Enamel Corp.
Harshaw Chemical Co.
Hommel, O., Co., Inc.
Uranium Oxide (Yellow-Orange-Black)
Drakenfeld, B. F., & Co., Inc.
Du Pont de Nemours, E. I., & Co , Inc., Electrochemicals Dept.
Ferre Enamel Corp.
Hommel, O., Co., Inc.
Vitro Mfg. Co.
Uverite
Harshaw Chemical Co.
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Vitro Mfg. Co.
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Clipper Mfg. Co.
Whiting
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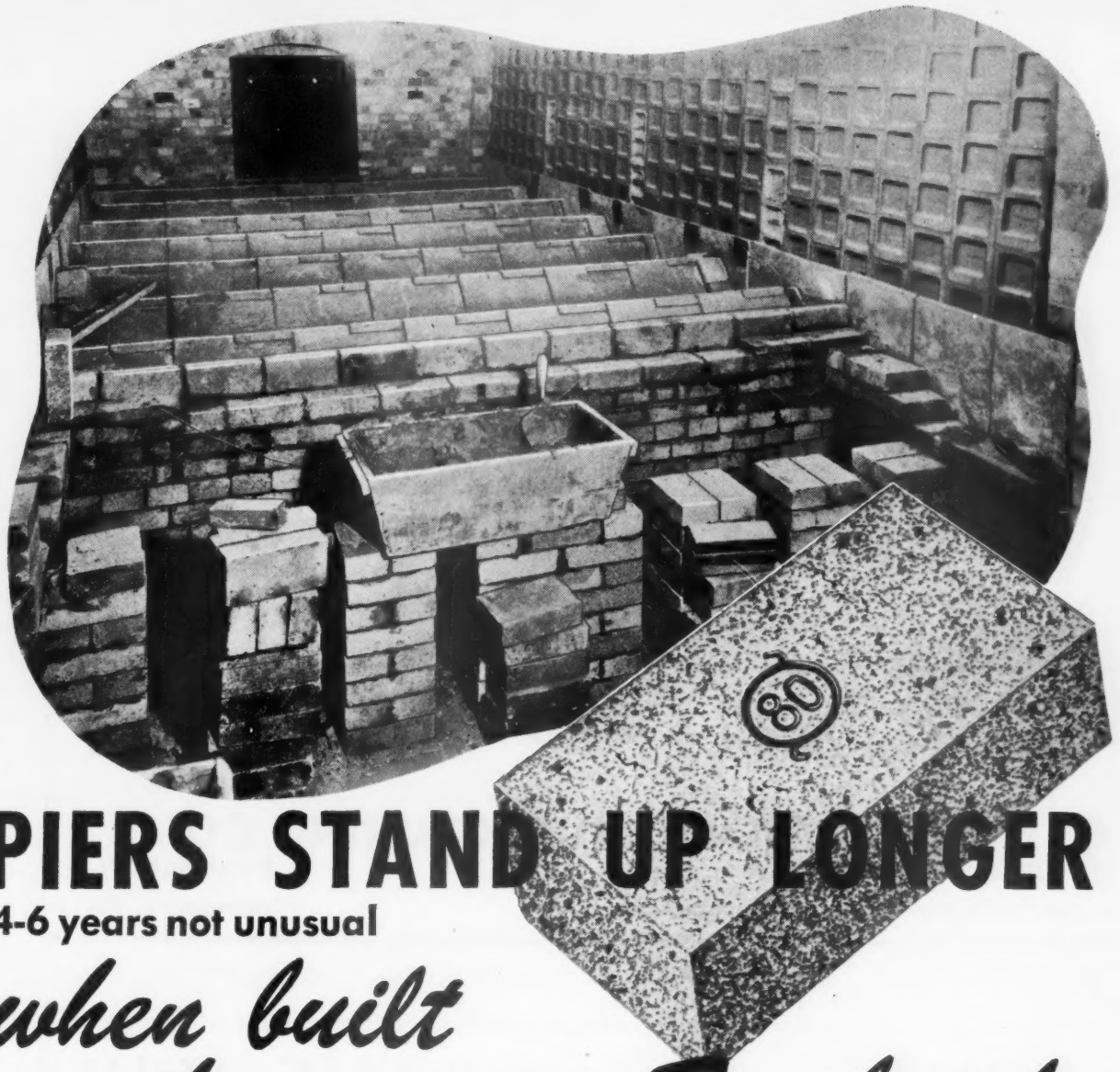
Du Pont de Nemours, E. I., & Co., Inc.
Hammill & Gillespie, Inc.
Harshaw Chemical Co.
Hommel, O., Co., Inc.
Potters Supply Co.
Vitro Mfg. Co.
Winding Drums
Lancaster Iron Works, Inc.
Zinc Oxide
Du Pont de Nemours, E. I., & Co., Inc.
Harshaw Chemical Co.
Hommel, O., Co., Inc.
Vitro Mfg. Co.
Zircon
Foote Mineral Co.
Hommel, O., Co., Inc.
Metal & Thermit Co.
Orefraction, Inc.
Titanium Alloy Mfg. Co.
Zirconia
Foote Mineral Co.
Hommel, O., Co., Inc.
Metal & Thermit Corp.
Orefraction, Inc.
Titanium Alloy & Mfg. Co.
Vitro Mfg. Co.
Zirconium Oxide
Foote Mineral Co.
Hommel, O., Co., Inc.
Orefraction, Inc.
Titanium Alloy Mfg. Co.
Zircon Refractories
Corhart Refractories Co.
Remmey, Richard C., Son Co.
Titanium Alloy Mfg. Co.
Zirconium Silicate
Foote Mineral Co.
Hommel, O., Co., Inc.
Metal & Thermit Corp.
Orefraction, Inc.
Titanium Alloy Mfg. Co.
Zirkite (Natural ZrO_2)
Foote Mineral Co.
Hommel, O., Co., Inc.



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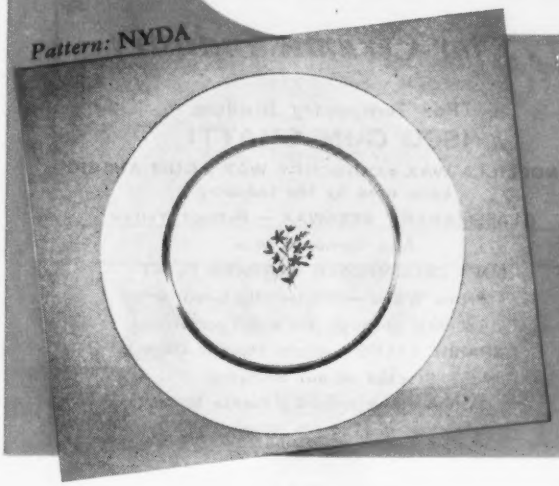
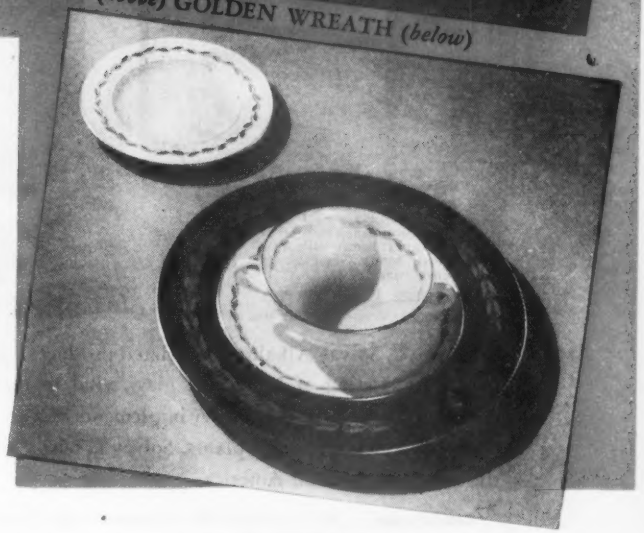


Pattern: NYDA

Patterns: WHEAT (*above*) GOLDEN WREATH (*below*)



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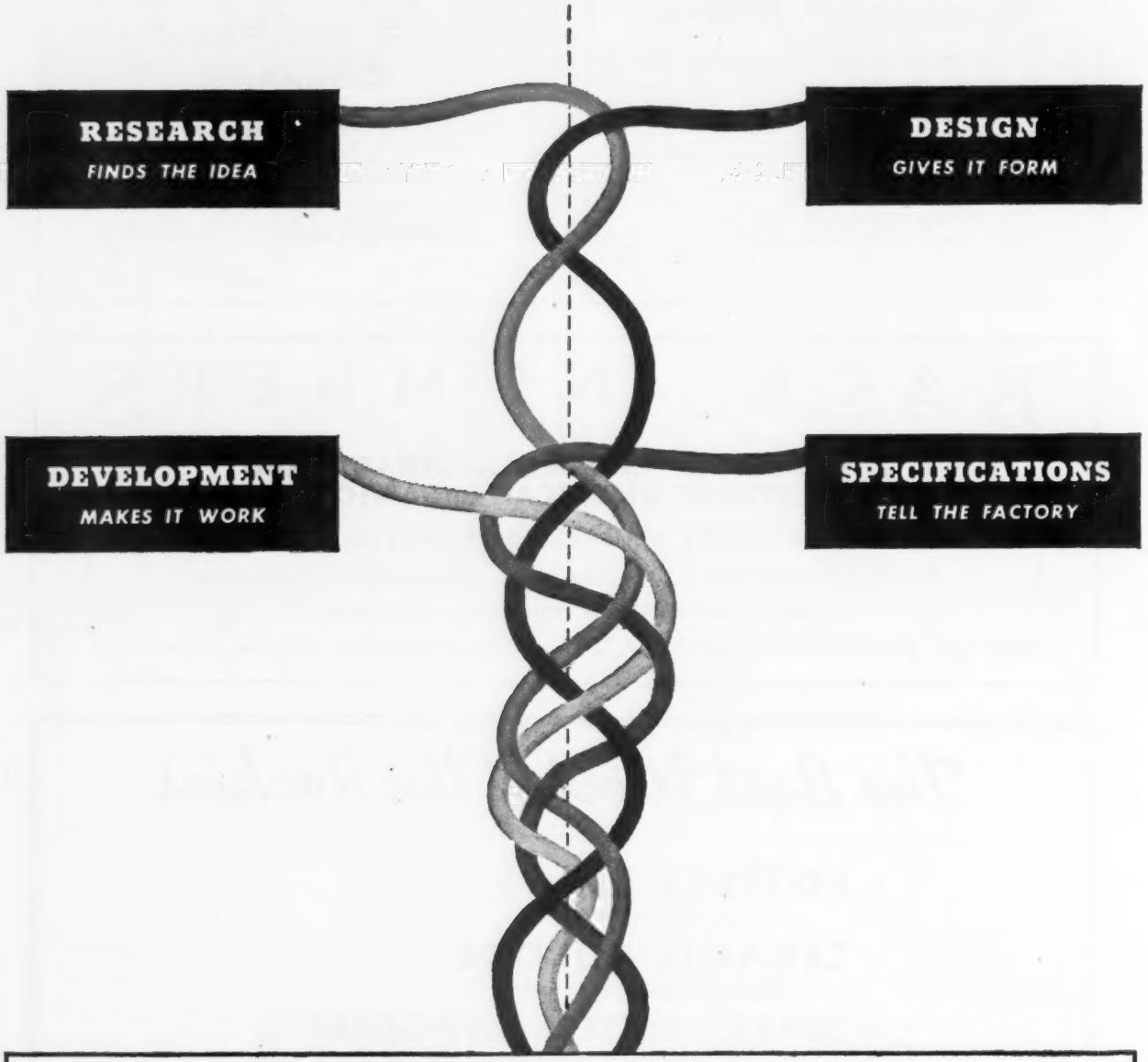

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